CSM Unit 1, Upper Watersheds

Prichard Creek

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ABBREVIATIONS AND ACRONYMS

AWQC	Ambient Water Quality Criteria
BLM	Bureau of Land Management
cfs	cubic foot per second
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	conceptual site model
CV	coefficient of variation
EE/CA	Engineering Evaluation and Cost Analysis
EPA	U.S. Environmental Protection Agency
EV	expected value
FS	feasibility study
µg/L	microgram per liter
NFCDR	North Fork Coeur d'Alene River
North Fork	North Fork Coeur d'Alene River
PDF	probability density function
PrichCrkSeg	Prichard Creek segment
PRG	preliminary remediation goal
RI	remedial investigation
SL	screening level
TMDL	total maximum daily load
URSG	URS Greiner, Inc.
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WRCC	Western Regional Climate Center

1.0 INTRODUCTION

The Prichard Creek Watershed is located within the Coeur d'Alene River basin and is a western-flowing tributary of the North Fork Coeur d'Alene River (North Fork). The Bureau of Land Management (BLM) has identified 58 source areas (e.g., mining waste rock dumps, adits, and jig tailings piles) within the watershed (BLM 1999). The watershed has been affected by mining activities and past and continuing releases of mining wastes.

Previous clean-up action in the Prichard Creek watershed consists of some isolated portal closures conducted by the USDA Forest Service in the 1998, 1999, and 2000 field seasons. A non-time critical CERCLA removal action is planned by the USDA Forest Service for implementation at the Paragon Mine in the Prichard watershed for the 2001/2002 construction season. A non-time critical CERCLA removal action is also planned for the Jack Waite mine and mill site on the East Fork of Eagle Creek, a tributary of Prichard Creek. Sampling in support of development of an Engineering Evaluation and Costs Analysis (EE/CA) is currently being performed to support decision-making for the cleanup of this site. The Forest Service is working under an agreement with an identified potential responsible party to facilitate this clean-up action (Johnson 2000).

The Prichard watershed is included in an integrated watershed analysis of the Prichard, Beaver and Eagle Creek drainages that is being currently performed for the Forest Service and Bureau of Land Management by the United States Geological Survey. The watershed analysis is being used to help assess the environmental and human health risks, and to establish priorities for reclamation work at numerous abandoned mine sites located in the National Forest lands in these watersheds (Johnson 2000).

This watershed is one of eight watersheds assigned to conceptual site model (CSM) Unit 1, Upper Watersheds (see Part 1, Section 2, Conceptual Site Model Summary). The watershed itself has been divided into three segments to focus this investigation (Figure 1.1-1). Brief descriptions of each segment are presented in this section.

1.1 SEGMENT DESCRIPTIONS

Segment PrichCrkSeg01 contains the headwaters of Prichard Creek down to just above the Paragon mill site (Figure 4.1-1). The BLM identified five mining-related sites (source areas of potential metals contamination) in this segment; however, Prichard Creek does not receive much metals input from this segment. The area is relatively undisturbed with an intact and well-vegetated riparian zone and stable stream banks.

Segment PrichCrkSeg02 contains Bear Gulch, a tributary to Prichard Creek (Figure 4.1-3). The BLM identified nine source areas in this segment. Slightly elevated concentrations of dissolved lead have been observed in the lower part of Bear Gulch. The area is relatively undisturbed, with an intact and well-vegetated riparian zone and stable stream banks.

Segment PrichCrkSeg03 contains Prichard Creek, below the Paragon mill site, to its confluence with the North Fork (Figure 4.1-5). The BLM identified 44 source areas in this segment. Sampling of surface water indicates that metals concentrations in surface water are greater than ambient water quality criteria (AWQC).

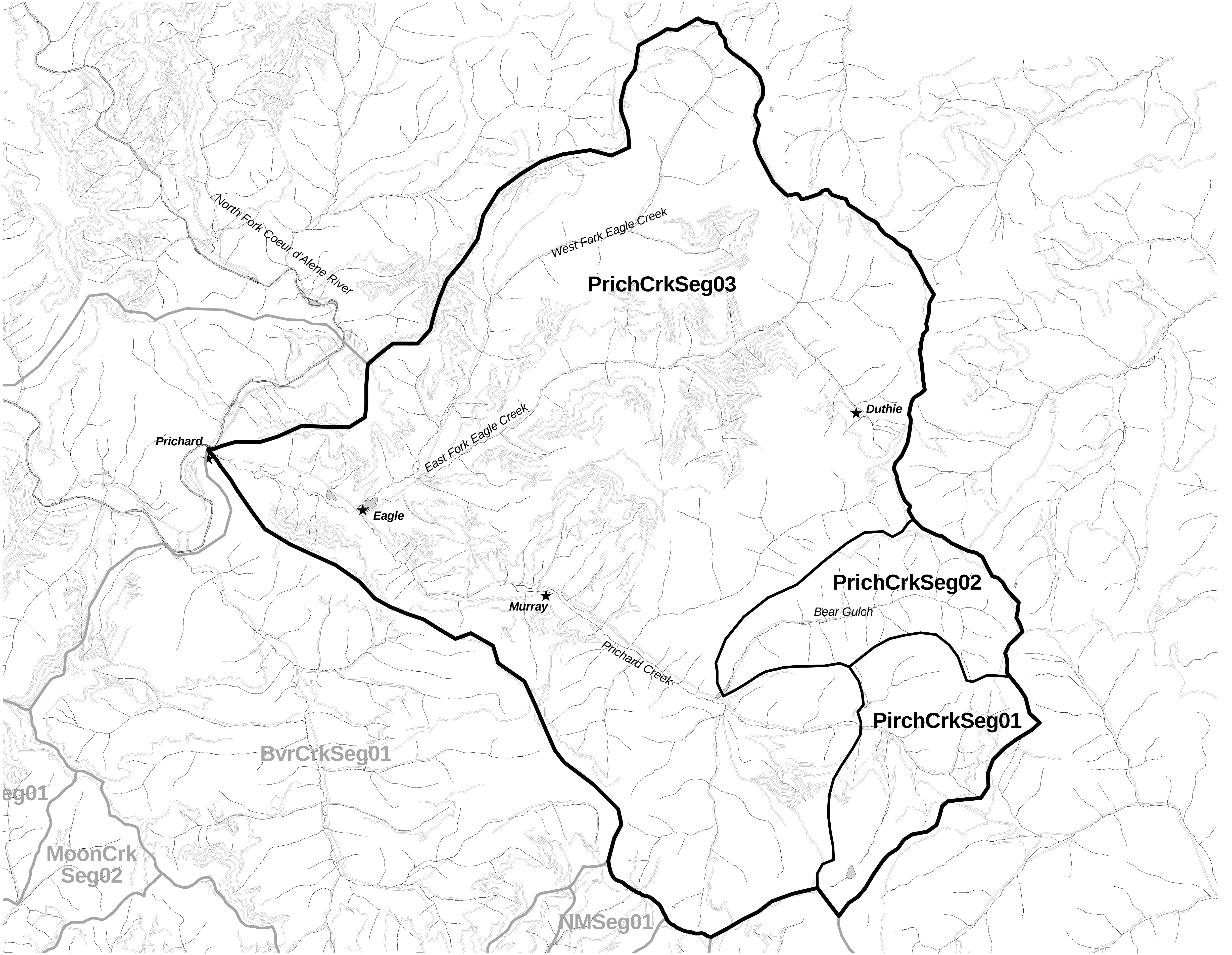
1.2 REPORT ORGANIZATION

The remedial investigation report is divided into seven parts. This report on the Prichard Creek Watershed is one of eight reports contained within Part 2 presenting the remedial investigation (RI) results for the eight CSM Unit 1 upper watersheds. The content and organization of this report are based on U.S. Environmental Protection Agency (EPA) Guidance Document for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final (USEPA 1988). This report contains the following sections:

- Section 2–Physical Setting, includes discussions on the watershed's geology, hydrogeology, and surface water hydrology.
- Section 3–Sediment Transport Processes
- Section 4–Nature and Extent of Contamination; includes a summary of chemical results and estimates of mass loading from source areas
- Section 5–Fate and Transport; includes chemical and physical transport processes for metals
- Section 6–References

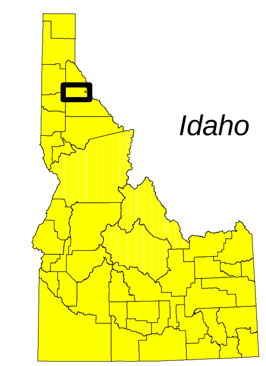
Risk evaluations and potential remedial actions associated with source and depositional areas are described in the human health risk assessment, the ecological risk assessment, and the feasibility study (all under separate cover).

Figure 1.1-1
Prichard Creek Watershed



LEGEND

- Stream
- Road
- City
- Prichard Creek Watershed
- Prichard Creek Segment
- River Segment
- Lake/River



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

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Coeur d'Alene Basin RI/FS
RI REPORT

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This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

2.0 PHYSICAL SETTING

2.1 GEOLOGY AND MINES

The geology and mining history of the Prichard Creek Watershed are presented in this section.

2.1.1 Geomorphic Setting

The Prichard Creek Watershed is located in the northeast portion of the district, situated between the North Fork Coeur d'Alene River (North Fork) and the Idaho-Montana border (Part 1, Figure 1.2-2). Prichard Creek, the principal drainage of the watershed, flows in a westerly direction from its headwaters in the Bitterroot Mountains and empties into the North Fork (Part 1, Figure 1.2-2). The headwaters of the watershed consist of the upper reaches of Prichard Creek and Sullivan, Cascade, and Paragon Gulches at elevations ranging from 5,500 to 5,900 feet. The elevation at the mouth of Prichard Creek where it empties into the North Fork is 2,500 feet.

Like most drainages in the district, Prichard Creek and its tributaries flow through narrow, steep-walled, V-shaped canyons throughout their course, with the exception of the lower five mile reach of Prichard Creek between Murray and the North Fork (Umpleby and Jones 1923). The Prichard Creek channel widens along this five mile reach, generally exhibiting a relatively flat floodplain up to 0.5 mile wide that is enclosed by steep canyon walls.

2.1.2 Bedrock Geology

Weakly metamorphosed sedimentary rocks assigned to the Precambrian Belt Supergroup are the most prevalent rocks within the Prichard Creek Watershed (Umpleby and Jones 1923). The Prichard Formation argillite is by far the dominant rock type in the watershed. Lesser amounts of Burke Formation quartzite occur at the headwaters of Prichard Creek and in the following drainages that flow into Prichard Creek: Sullivan and Cascade Gulches, and at the upper part of Paragon Gulch (Umpleby and Jones 1923). The Burke Formation also occurs at the confluence with the North Fork, as do smaller masses of Wallace Formation (which consists of alternating beds of carbonate-bearing quartzite and argillite) and St. Regis Formation (consisting of thin-bedded quartzite and argillite).

Aside from Belt Supergroup rocks, the Gem Stock igneous monzonite outcrops along Granite Gulch and on the north side of Prichard Creek in the vicinity of the town of Raven and Cement

Gulch, about 9 miles above the confluence of Prichard Creek and the North Fork (Umpleby and Jones 1923).

The geologic contact between the Burke and Prichard Formations at the headwaters of the watershed is fault-controlled (Umpleby and Jones 1923). Similarly, in the vicinity of Eagle (about 2.5 miles above the confluence of Prichard Creek and the North Fork) the contacts between the Burke and Wallace Formations, and the Wallace and Prichard Formations are also fault-controlled (Umpleby and Jones 1923).

2.1.3 Structural Geology

The structural fabric of the Prichard Creek Watershed is dominated by two distinct structural trends: roughly east-west and north-northwest (Hobbs et al. 1965). There are two major, roughly parallel, north-northwest-trending faults of the watershed: (1) the northern extension of the Dobson Pass Fault, a normal fault (Part 1, Figure 3.2-2); and (2) the Murray Peak Fault (Hobbs et al. 1965), located 2 to 3 miles east of the Dobson Pass Fault, and extending northward beyond the trace of the Dobson Pass Fault. The sedimentary rocks in the area between these two faults have been folded into a north-trending anticlinal structure (Hobbs et al. 1965); north-trending fold axes are typical of the district to the north of the Osburn Fault (Hobbs et al. 1965).

The roughly east-west-trending Thompson Pass Fault (Hobbs et al. 1965) is the most prominent east-west structure in the watershed. The trace of this fault runs from the headwaters of Prichard Creek to a point about one mile south of Murray (Hobbs et al. 1965).

Mines in this watershed are typically fissure vein deposits with vein material (primarily quartz) filling faults and fractures.

2.1.4 Soils

Like most of the soils throughout the district, the soils of the Prichard Creek Watershed can be grouped into two broad categories: hillside soils and valley soils. Hillside soils typically consist of silty loam with variable amounts of gravels and clay, generally less than 2 feet thick (MFG 1992; Camp Dresser & McKee 1986). Valley soils are found within and along the flanks of Prichard Creek, most notably along the 5-mile reach above the confluence with the North Fork, and within and along the lower reaches of the various drainages that flow into Prichard Creek (Umpleby and Jones 1923).

The valley soils typically consist of gravel, sand and silt deposited on valley bottoms; in some areas this material is mixed or covered with tailings from milling operations (Umpleby and Jones 1923). Tailings are discussed further in Section 4, Nature and Extent of Contamination.

Three to 5 miles upstream of the confluence of Prichard Creek and the North Fork are terrace gravels (Umpleby and Jones 1923), which are a series of irregular masses up to 1 mile across in their longest dimension. These deposits are mixtures of sand and gravel that exist as benches up to 1,200 feet above nearby streams (Umpleby and Jones 1923).

Elevated metal concentrations may be present in some soils overlying ore deposits. These elevated concentrations or dispersion patterns were studied by the USGS (Gott and Cathrall 1980). The background evaluation presented in Part 1 of the RI takes into account this process.

2.1.5 Ore Deposits

Most of the mines in the Prichard Creek Watershed produced silver, lead, and zinc as their principal commodities. However, this watershed includes a series of mines (currently apparently not operating) whose principal commodity was gold, which is unlike all other areas within the district. Most of the gold mines are located within a 2-mile radius of the town of Murray (Part 1, Figure 1.2-2) (Ransome and Calkins 1908).

The Jack Waite is typical of most ore deposits in the watershed in that it consists of a steeply-dipping lead-zinc-silver fissure vein deposit which cuts across the bedding of the enclosing Prichard Formation argillite and quartzite (Umpleby and Jones 1923). Vein width varies from a fraction of an inch to 10 feet, averaging approximately 4 feet (Umpleby and Jones 1923). The ore minerals are galena and lesser sphalerite; the non-ore (gangue) minerals are quartz, and lesser siderite and pyrite (Umpleby and Jones 1923).

Gold mines in the watershed were typically nearly flat-lying gold-quartz veins that occurred parallel to the argillite beds of the Prichard Formation which enclosed the deposits (Ransome and Calkins 1908). The producing veins were typically 1-foot wide, although a maximum width of 10 feet is recorded (Gold Chest Mine). The non-ore minerals pyrite, siderite, and calcite were typically absent (or nearly so) from the gold-quartz veins (Ransome and Calkins 1908).

Waste rock piles are present at all mine workings and consist of broken, angular rock that is generally not milled and typically dumped near the mouth of workings. The largest waste rock pile in the watershed is located at the Jack Waite Mine, located 6 miles north of the town of

Murray (Part 1, Figure 1.2-2). The chemical and mineralogical content of waste rock in the Prichard Creek Watershed is discussed further in Section 4, Nature and Extent of Contamination.

In addition to the hard-rock mining of gold-quartz veins, alluvial or placer gold was recovered from bench gravels lying from 250 to 300 feet above the present streams and recent stream gravels (Ransome and Calkins 1908). Production figures for placer gold are apparently not available; however, it is assumed that placer gold production was considerably less than hard-rock gold mining.

2.1.6 Mining History

A brief summary of available information on historical mining activities is presented in this section. During the RI/FS process, an extensive list of mines, mills, and other source areas was developed based on a list originally developed by the Bureau of Land Management (BLM 1999). This list is presented in Section 4.1, Nature and Extent, and in Appendix I.

The beginning of mining activity within the Prichard Creek Watershed can likely be attributed to Andrew Prichard. Prichard, who is also credited with the first discovery of gold in the Coeur d'Alene Mining District, began exploring drainages of the North Fork soon after his discovery of gold near the South Fork drainage of Big Creek. In 1882, Prichard found evidence of placer gold along Prichard Creek, and in March of 1883 he staked a claim east of the confluence of Eagle and Prichard Creeks. A small boom ensued as other miners staked claims in the area (Quivik 1999).

In contrast to the lead-zinc operations that were common in drainages of the South Fork, most of the early mining activity within the Prichard Creek Basin continued to be centered around gold mining. Gold mining was typically performed through a process known as placer mining. Placer mining consists of using high-pressure water to erode large volumes of alluvial material that is then washed through sluice boxes to recover gold. Although this type of mining practice does release large amounts of sediments, it does not alter the size or chemical composition of the mined material. Milling of gold ore was typically accomplished through a stamp milling process. Although mercury was sometimes used for this process, historical evidence for most mills in this area suggest that vanners were used to produce a product of nearly pure gold dust. Because this process recovered only several ounces of gold per ton of ore process, it has been assumed that essentially all of the material processed by these mills was disposed of within Prichard Creek and its tributaries (Quivik 1999).

Beginning in the early twentieth century, mines within the basin began to extract metals other than gold. None of these mines operated for as long or as continuously as the more profitable mines located within drainages of the South Fork (Quivik 1999). Many of the mines in the watershed were limited by access. In 1909, the completion of the Idaho Northern Railroad to a terminal 6 miles east of Murray helped spur some additional development of mining in this area (IGS 1999).

Production records for mines in the Prichard Creek Watershed indicate that approximately 636,000 tons of ore were mined, resulting in an estimated 497,000 tons of tailings (SAIC 1993). From this ore, an estimated 64,724 tons of lead, 15,567 tons of zinc, 56 tons of copper, 19 tons of silver and 0.38 tons of gold were produced (Mitchell and Bennett 1983).

2.1.6.1 Mines

The mines that operated in the Prichard Creek Watershed for which for production was recorded are listed in Table 2.1-1. This table includes the production years of the mine, estimated volumes of ore and tailings produced as a result of the mining activity, and the segment in which the mine is (or was) located. Only mines with documented ore production are listed. Additionally, some mining company operations were carried out at more than one location, occasionally in more than one segment or even in more than one watershed. The ore production listed in Table 2.1-1 is the total for all mining operations.

2.1.6.2 Mills

Table 2.1-2 lists the mills with operations in the Prichard Creek Watershed for which there are records. This table includes the operating years of the mill and a summary of ownership, and the segment in which the mill is located. Not all mills are listed because records were not available for all mills.

2.1.7 Mine Workings

Underground workings in many mines are very extensive and act as collection and distribution systems for groundwater. Individual mine workings in this watershed are typically located within a single, relatively steep ridge. Recharging water infiltrates at the highest levels of a mountain ridge and discharges on the same ridge. This is referred to as a local flow system, characterized by short groundwater flow paths (a flow path is the route by which the water enters and exits the groundwater system) (Toth 1963).

Many adits and tunnels in this watershed act as discharge points for groundwater. Typically, adit drainage discharges directly to surface water or first infiltrates waste rock piles before discharging to surface water from seeps. Estimates on the number of adits and tunnels that are known to discharge mine drainage in this watershed are not available.

2.2 HYDROGEOLOGY

2.2.1 Conceptual Hydrogeologic Model

The hydrogeology of the Prichard Creek Watershed can be divided into two main groundwater systems: the bedrock aquifer and the shallow alluvial aquifer. The conceptual hydrogeologic model for the watershed assumes that a single unconfined aquifer is present in the shallow alluvial sediments, and these sediments are the principal hydrostratigraphic unit in the watershed. The shallow alluvial sediments consist of natural materials as well as mine tailings and waste rock. In general, the alluvium increases in thickness from the headwaters of Prichard Creek toward its confluence with the North Fork (Umpleby and Jones 1923). Very little specific hydrogeologic data are available for the Prichard Creek Watershed.

The bedrock aquifer within the Prichard Creek Watershed consists of argillites and quartzites of the Precambrian formations of the Belt Supergroup, including (principally) the Prichard Formation, and lesser amounts of the Wallace, Burke, and St. Regis Formations (Figure 4.3-2) (Hobbs et al. 1965). Relatively small masses of Cretaceous-aged igneous quartz monzonite are present about 3 miles north of the town of Murray (Part 1, Figures 1.2-2 and 3.2-2). In general, the bedrock has very low permeability. Secondary features such as fractures, faults, or mine workings may increase the permeability substantially. The hydrogeology of the bedrock aquifer is discussed in Section 2.1.7, Mine Workings.

The groundwater system of unconsolidated sediments overlying less permeable rocks occurs primarily in an elongate trough along the Prichard Creek, and varies in shape between V-shaped (e.g., as occurs between the headwaters in the Bitterroots to Murray) to U-shaped (e.g., as occurs between Murray and the confluence with the North Fork) (Part 1, Figure 1.2-2) (Umpleby and Jones 1923). The width of the V-shaped trough is as narrow as about 200 feet above Murray, and is as wide as approximately 1,500 feet between Eagle and the confluence with the North Fork (Part 1, Figure 1.2-2) (Umpleby and Jones 1923).

As observed in wells in the Canyon Creek and Ninemile Creek Watersheds, it is assumed that groundwater levels fluctuate seasonally. Groundwater levels are generally highest in the late spring and lowest during winter and early spring when precipitation rates are lowest and snowmelt is not occurring.

2.2.2 Aquifer Parameters

Aquifer parameters are not available from the Prichard Creek Watershed for the presumed single unconfined aquifer in unconsolidated sediments overlying bedrock. However, based on reported lithologic similarities between the presumed single unconfined aquifer and the upper aquifer of the Smelterville Flats-Bunker Hill aquifer system, it is reasonable to expect that aquifer parameters presented in Table 2.2-1 are similar to the presumed single unconfined aquifer of the Prichard Creek Watershed. The range of horizontal hydraulic conductivities presented in Table 2.2-1 are typical of clean sand and gravels (Freeze and Cherry 1979).

2.2.3 Flow Rates and Directions

Based on similar watersheds (e.g., Canyon Creek and Ninemile Creek), it can be assumed that the general groundwater flow direction in the Prichard Creek Watershed parallels the flow of Prichard Creek surface water. Based on water level data recorded in Canyon Creek, it can be assumed that there are localized areas in Prichard Creek where the flow direction is downstream and toward the creek and some areas where the flow direction is downstream and away from the creek.

Based on an analysis of groundwater elevations in the water table aquifer in the Woodland Park area of Canyon Creek, which appears comparable to the Murray area along Prichard Creek, it can be assumed that groundwater in Prichard Creek has a fairly steep gradient, generally following the ground surface topography (Part 1, Figure 1.2-2). The gradient of 0.035 calculated for the Woodland Park area is inferred to be comparable to the Murray area (Part 1, Figure 1.2-2).

2.2.4 Surface Water/Groundwater Interaction

Based on groundwater information collected from the Canyon Creek Watershed, it can be assumed that shallow alluvial deposits along Prichard Creek serve as aquifers, and if they are hydraulically connected, they are capable of taking from or adding to flow in the creek. It is further assumed that the interaction of the surface water in Prichard Creek and groundwater in the shallow alluvial aquifers creates gaining or losing reaches. During the spring snowmelt and resulting high creek levels, the gaining reaches of the stream may temporarily experience reversals in the surface water/groundwater hydraulic gradient (i.e., become losing reaches).

2.2.5 Groundwater Use

Use of groundwater supplies for domestic, municipal, and industrial applications (as it relates to human consumption) is discussed in the Baseline Human Health Risk Assessment.

2.3 SURFACE WATER HYDROLOGY

The following sections describe the surface water hydrology of Prichard Creek, a tributary to the North Fork. The watershed has a drainage area of approximately 97.8 square miles with approximately 45 miles of mapped channel length.

2.3.1 Available Information

The available hydrologic information for Prichard Creek includes United State Geological Survey (USGS) stream flow data for water year 1999, climatological data for Wallace, ID, and instantaneous discharge data from a variety of consultants obtained between 1998 and 1999.

The USGS began reporting stream flow discharge data from Station Number 12411935, at the mouth of Prichard Creek at Prichard, ID, on October 1, 1998 (USGS 2000). This station is located at the downstream end of segment PrichCrkSeg03. This station records water stage at 15-minute intervals. Discharge is calculated from the stage data based on a rating curve developed for the specific gage. The rating curve is developed through time by measuring discharge at known stages to relate stage to discharge. Once a rating curve is developed, a discharge can be calculated by comparing a known stage to the rating curve. One complete year of discharge data, water year 1999, is available for Prichard Creek. Water year 1999 ran from October 1, 1998 to September 30, 1999. Precipitation data from the Western Regional Climate Center (WRCC) station at Wallace, Woodland Park were collected for the same period. This precipitation gage is the nearest gage to Prichard Creek (WRCC 2000). The mean daily discharge hydrograph and precipitation data are presented in Figure 2.3.1-1.

Stream discharge measurements were taken in association with water quality sampling events completed by URS and USGS. These measurements occurred from May 6, 1998, to September 8, 1999. These data are summarized in Table 2.3.1-1.

In addition to the USGS and consultants' hydrologic information, the U.S. Department of Housing and Urban Development, Federal Insurance Administration completed a flood insurance study for the Shoshone County, Idaho in 1979 (FIA 1979). This document reported computed peak discharges for 10-year (3,850 cubic feet per second [cfs]), 50-year (6,480 [cfs]), 100-year (8,020 cfs) and 500-year (12,190) events near the mouth of Prichard Creek. Although these values reported might be dated and coefficients used to calculate these discharges may contain some error, they do provide some basis for selecting a design discharge for remedial actions.

2.3.2 Hydrologic Description

This section describes the hydrology of Prichard Creek based on water year 1999 stream discharge and precipitation data and discharge measurements obtained during water quality sampling. Base flow discharge is estimated at 15 to 20 cfs, and average annual discharge is approximately 225 cfs. The maximum instantaneous discharge recorded during water year 1999 was 1,900 cfs, on May 25, 1999, with a mean daily discharge on that day of 1,750 cfs. The minimum mean daily discharge for this period of record was 16 cfs. The discharge measurements presented in Table 2.3.1-1 are consistent with the discharge measurements taken during 1999.

2.3.2.1 Flood Frequency

Because historical discharge data are not available for Prichard Creek, discharge estimates from the FIS are reported. These estimates are presented in Table 2.3.2-1. The values indicated in Table 2.3.2-1 are larger than the extrapolated maximum mean daily discharge for water year 1999 and may provide guidance for design of remedial actions. The bankful discharge, the approximately 1.5 year event, is estimated to be approximately 1,000 cfs.

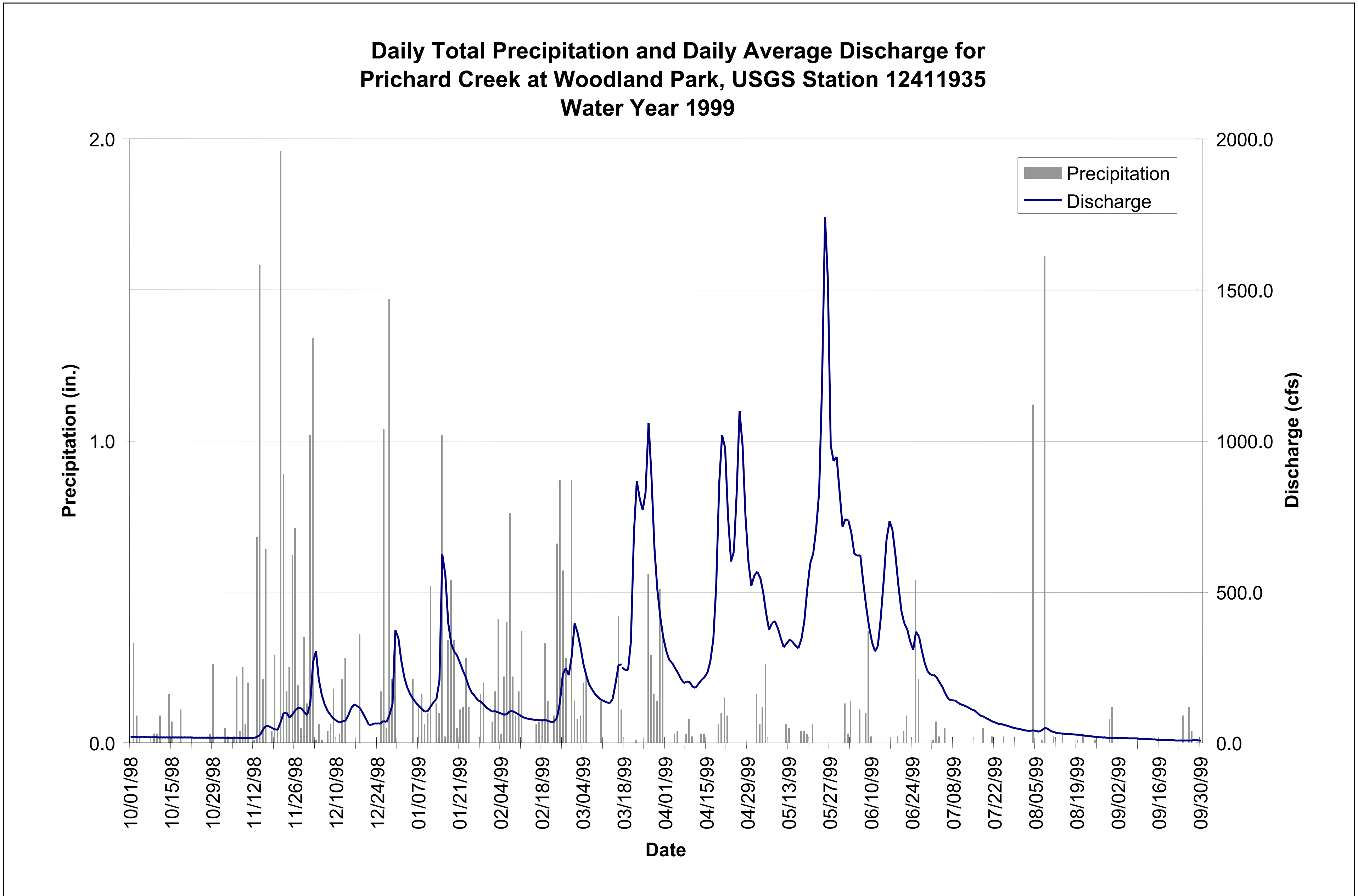
2.3.2.2 Water Year 1999

Total annual average precipitation at the WRCC Wallace at Woodland Park Station for the 51-year period of record is 37.7 inches while for water year 1999 the total precipitation was 39.8 inches. Total annual average snowfall for the WRCC station is 83.7 inches while for water year 1999 the total snowfall was 82.2. While these comparisons do not address monthly variations in precipitation, they do indicate that the water budget for water year 1999 was typical.

Table 2.3.2-2 summarizes the mean monthly flows for Prichard Creek, and the mean monthly precipitation (rain and snow water content), and total snowfall at the WRCC station at Wallace, Woodland Park. Table 2.3.2-1 and Figure 2.3.1-1 indicate the majority of precipitation, 83 percent, occurred from October to March. Much of this precipitation was in the form of snow that did not immediately run off into the channel. However, increased discharge, above the average annual discharge of 250 cfs, occurred four times during the winter and spring months, from December 2 to 3, from December 30 to January 1, from January 15 to January 22, and from February 25 to March 4, for a total of 21 days. In contrast, during the spring and summer months, discharge in Prichard Creek remained above the average annual discharge from March 16 to July 2, with the exception of April 6 to 13, for a total of 101 days.

The increase in discharge during the spring and summer is attributed to increased runoff caused by snowmelt in the upstream watersheds. Maximum daily temperature and mean daily discharge for water year 1999 for Prichard Creek are presented in Figure 2.3.2-1. Increased temperatures over these periods melted much of the snow in the upper basin. Rain on snow also may have contributed to these increased discharges as indicated in Figure 2.3.2-1 where precipitation events also occurred during periods of increased temperature.

Based on the existing data, it is expected that water year 1999 was typical from a total snowfall and total water budget perspective in the Prichard Creek Watershed. Runoff from spring snowmelt dominates the surface water hydrology. Variations in snowfall, temperature, and rainfall from year to year will influence the magnitude and timing of peak discharges.



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Prichard Creek Series
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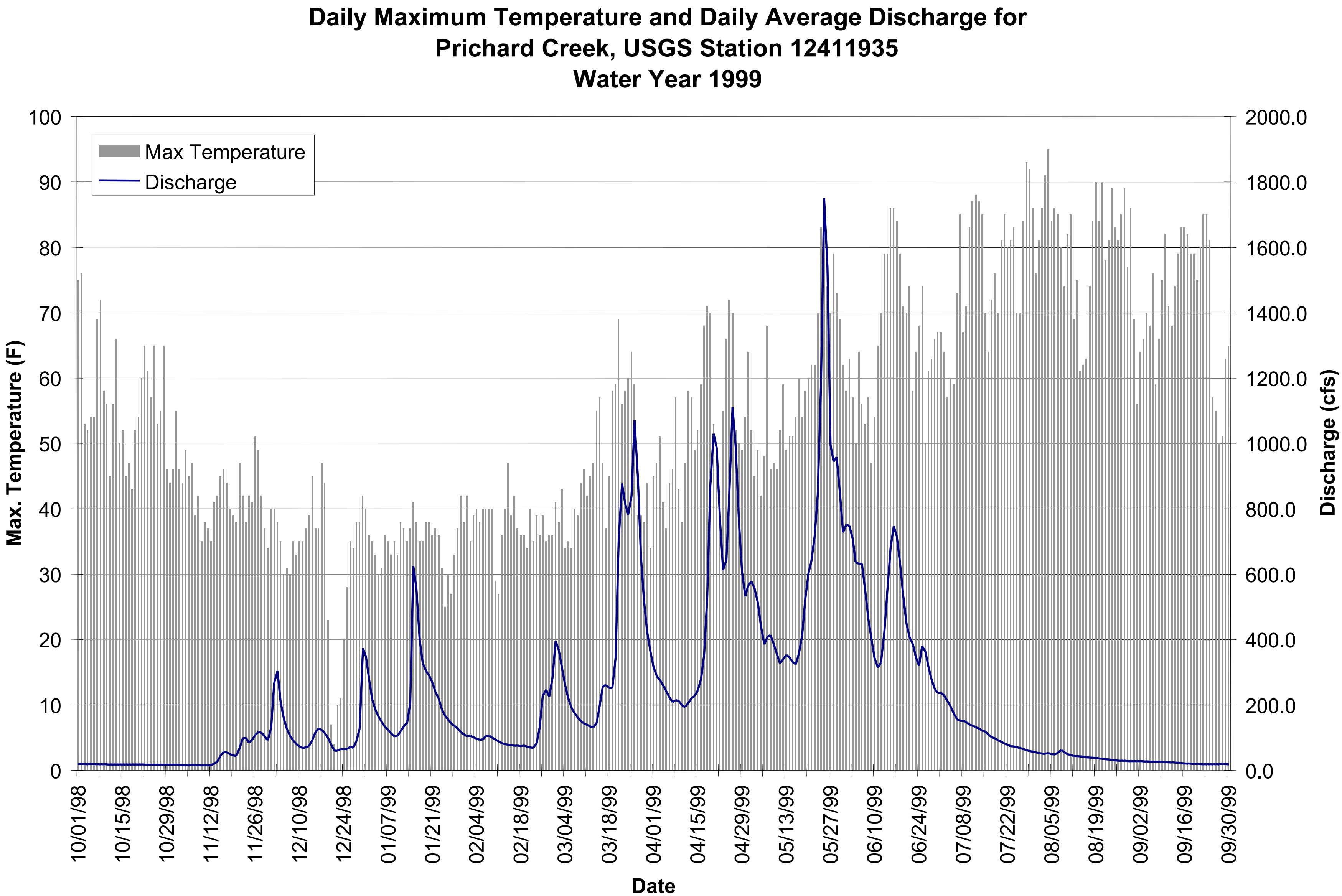
Figure 2.3.1-1



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Coeur d'Alene Basin RI/FS
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Prichard Creek Series
07/11/01

Figure 2.3.2-1

Table 2.1-1
Mines in Prichard Creek Watershed With Recorded Production

Segment	Production Years [a]	Ore (tons)[a]	Mill	Tailings (tons)[b]	Comments
Bear Top (Orofino) Mine					
PrichCrkSeg02	1904-1973	29,396	Bear Top Mill, Nabob concentrator near Pinehurst	36,053	The Bear Top Mining Company was developing the Beartop Mine by 1905. The Beartop Mine and Orofino Mine were consolidated by 1911. Historic information for the site tends to indicate that the mine operated fairly continuously mining lead ore through 1935. Ore from the mine accounted for the largest share of output from the Summit mining district in 1931. There is some mention of the mine operating again after World War II, but the duration of these operations is unclear. The mine was operated by lessees during several periods during the 1960s. Development work was restarted again in 1977 and the mine operated through 1980 (IGS 1999).
Black Horse Mine					
PrichCrkSeg01	1905, 1917-1948	8,621	Black Horse Mill	7,614	The Blackhorse Mine is located on Paragon Gulch, upstream of the Lower Paragon mine. The Idaho-Montana Summit Mining Company began operating the Blackhorse claim in 1905. The completion of the Idaho Northern Railroad to Murray in 1909, spurred considerable development at the mine due to ease of ore shipping. In 1910, a concentration mill was built on Paragon Gulch for processing of ore from the mine. The last recorded mining activity at the site occurred in 1948, when 110 tons of zinc-lead ore were shipped from the mine (IGS 1999).
Crystal Lead Mine					
PrichCrkSeg03	1941-1952	11,237	Silver Crescent Mill, Hercules Mill, Galena Mill	9,668	The Crystal Lead Mine is located about ¾ mile above the confluence of Cottonwood Creek and the West Fork Eagle Creek. The property was owned by the Lead Crystals Mining Company from about 1911 to 1931. In 1914 the mine consisted of about 250 feet of workings. By the end of the 1920s, total

Table 2.1-1 (Continued)
Mines in Prichard Creek Watershed With Recorded Production

Segment	Production Years [a]	Ore (tons)[a]	Mill	Tailings (tons)[b]	Comments
					development was approximately 2,400 feet. Several shipments of lead ore were shipped from the mine in 1924, 1925 and 1926 but apparently these shipments were not well documented. The mine was sold to the Crystal Lead Mining Company in 1931. After the purchase, the mine saw little activity for the next decade. In 1941 the mine was operated by a lessee. During that year, 300 tons of lead ore were shipped to the Silver Crescent mill near Osburn and 20 tons of ore were shipped to a smelter. In 1943, mine production consisted of 456 tons of zinc-lead ore that was shipped to the Hercules Mill and 5 tons of high grade ore that was shipped to the Bunker Hill Smelter. Crystal Lead Mines Company shipped 994 tons of lead ore to the Hercules mill in 1944. Ore production for the years 1945 and 1947 were shipped to the Galena Mill near Wallace. Production for these years was 4,288 and 1,517 tons respectively. The mine also shipped 36 tons of high-grade lead ore directly to a smelter (IGS 1999).
Golden Chest Mine					
PrichCrkSeg03	1902-1949	61,704	100 ton flotation plant owned by Idaho Mother Lode Gold Mines, Inc., Cedar Creek Mill	61,606	The Golden Chest Mine is located on Reeder Gulch near the town of Murray. The mine has been described as the principal gold mine in the Murray district. Maps of the mine show over 13,000 feet of workings. The Golden Chest Group also contained the first quartz claim recorded in the Murray district. The Golden Chest Mining Company was the first to incorporate in the Coeur d'Alene district in 1884. In 1937 and 1940, the Golden Chest accounted for the greatest percentage of metal output in the Summit district. Development of the mine continued during the 1980s and 1990s (IGS 1999).

Table 2.1-1 (Continued)
Mines in Prichard Creek Watershed With Recorded Production

Segment	Production Years [a]	Ore (tons)[a]	Mill	Tailings (tons)[b]	Comments
Jack Waite Mine					
PrichCrkSeg03	1928-1969	513,652	Jack Waite Mill	374,323	***Jack Waite Mine* (not listed as a source by BLM)** The Jack Waite Mine was discovered around 1900. Shipments from the mine began the following year. The mine was operated until being closed around 1918 due to flooding that made roads to the mine impassable. The mine was later reopened in 1923. The Jack Waite Mining Company took over the mine in 1927 and soon merged with the Silver King Mining Company. The mine was closed for a short time in 1932 but was reopened in 1933. The American Smelting & Refining Company (Asarco) acquired a 40-year lease on the property in 1934 and operated the mine until relinquishing the lease in 1961. Other lessees operated the mine from 1962 to 1965. The mine has been inactive since that time except for periodic exploration programs (IGS 1999).
Liberty Mine					
PrichCrkSeg03	1954	5			The Liberty Mine is located north of the town of Murray, near the headwaters of Cougar Gulch. Little of the mine's history is known, except that a small quantity of lead ore was shipped from the mine in 1954. A site inspection conducted in 1996 reported that a single open adit and waste dump are located on the property. A seep from the adit was observed (IGS 1999).

Table 2.1-1 (Continued)
Mines in Prichard Creek Watershed With Recorded Production

Segment	Production Years [a]	Ore (tons)[a]	Mill	Tailings (tons)[b]	Comments
Mother Lode Mine					
PrichCrkSeg03	1911,1939	350	Mother Lode Mill, Golden Chest Mill, Mountain Lion Mill	345	The Mother Lode group includes the Yosemite, Daddy, Treasure Box, Mother Lode, and Occident mines. Mining in the Mother Lode group began about 1883. Various historical references provide mention of gold ore extraction from the Mother Lode in 1911, 1934, and 1938, but little information is available about how continuous operations were. Little mention can be found of operations at the mine after 1938, except for an exploration project by Newmont Mining in the late 1980s (IGS 1999).
Silver Strike Mine					
PrichCrkSeg03	1909-1948	4,186	Cedar Creek Mill	3,673	The Cedar Creek Mining Company began operations on the Cedar Creek Mine (renamed Silver Strike mine in 1936) in 1909. In 1928 and 1929 Cedar Creek lead ore accounted for the greatest percentage of ore produced in the district. Production from 1909 to 1930 was 5,421 tons of ore, 33.88 ounces of gold, 23,481 ounces of silver, 5,039 pounds of copper, and 910, 713 pounds of lead. After being renamed in 1936, the mine operated for approximately a year before a fire destroyed buildings and equipment on-site. The property did not operate after this time (IGS 1999).

Table 2.1-1 (Continued)
Mines in Prichard Creek Watershed With Recorded Production

Segment	Production Years [a]	Ore (tons)[a]	Mill	Tailings (tons)[b]	Comments
Terrible Edith (Pontiac) Mine					
PrichCrkSeg03	1904-1955	6,456	Hercules Mill, custom milling plant in Utah	3,606	The Terrible Edith Mine is located north of Murray, near the headwaters of Wesp Gulch. The Terrible Edith was formed by the consolidation of the Terrible Group and the Edith, which were located about 1886 by James Woods and Wash Snyder respectively. Some shipments of ore were made from 1912 through 1917. By this time, the high grade lead and zinc ore from the mine accounted for some of the best product in the district. Carload lots of ore assayed as high as 63% lead. A small shipment of ore was reported in 1921. In 1925 the property was acquired by the Chester Company, which was later reorganized as the Pontiac Mining Company. Several shipments of ore were reported in 1926 and the company shipped one car of lead-zinc ore for testing in 1928. In 1928 the company also announced that it had enough ore exposed to justify construction of a 50-ton flotation mill, but apparently the mill was never built. One car of ore was shipped in 1929, and a lessee shipped 115 tons of lead-zinc ore to the Hercules Mill near Wallace during the following year. A small shipment was also reported shipped to a mill in Utah during 1934. In 1947, 495 tons of zinc-lead ore were shipped from the mine and in 1950, mine production yielded 68 tons of concentrates. Ore was also produced from the mine in 1954 (IGS 1999).

Note:
Blank cells indicate there was most likely no mill located on site, and ores were probably shipped elsewhere for milling. No records were found identifying the mill to which the ore was shipped. Estimated tailings produced by each mine were not necessarily disposed of within the reach where the ores were mined.

[a]Source: Mitchell and Bennett 1983
[b]Source: SAIC 1993

Table 2.1-2
Mills With Documented Operations in Prichard Creek Watershed

Segment	Operating Years	Ownership	Comments
Bear Top Mill			
PrichCrkSeg02	1906- ???	Bear Top Mining Company	The Bear Top Mining Company operated one of the first concentrators in the Murray area. The equipment for the mill was purchased from the Black Bear Mill in 1904. The mill went into operation in 1906, producing lead-silver concentrates. In 1909, the mill was modified to also produce zinc concentrates (Quivik 1999). The Bear Top and Orofino mines were consolidated in 1911. By this time, ore was being processed at a 150-ton mill. In 1929, the mill was rebuilt and capacity was increased to 200 tons per day (IGS 1999).
Black Horse Mill			
PrichCrkSeg01	1910-1917	Idaho-Montana Summit Mining Company	In 1910, a 150-ton concentration mill was built to process ores from the Black Horse Mine. The mill was located near the mouth of Paragon Gulch. The mill also processed ores from the Chicago Mine. Ore processing at the mill ceased about 1917 (IGS 1999).
Four Square Mill			
PrichCrkSeg03	Unknown	Four Square Gold Company	Little historical information is available for the Four Square Mill. There is some historical reference to a 10-stamp mill being operated at the site (IGS 1999).
Giant Ledge Millsite			
PrichCrkSeg03	Unknown		Mining records indicate that ore concentrates were shipped from the Giant Ledge Millsite in 1926 and 1930 (IGS 1999).

Table 2.1-2 (Continued)
Mills With Documented Operations in Prichard Creek Watershed

Segment	Operating Years	Ownership	Comments
Golden Chest Mill			
PrichCrkSeg03	1894-1916	Gold Chest Mining Co. (Quivik 1999)	The Golden Chest Mill was the first mill in the Coeur d'Alene district to produce tungsten. The mill began operating in 1894 as a 10-stamp gold mill equipped with vanners. The mill was later enlarged to 20 stamps. The mill was operated through about 1916 (Quivik 1999).
Jack Waite Mill			
PrichCrkSeg03	1926- ???	Jack Waite Mining Company, possibly operated by ASARCO under a lease agreement.	A 125-ton flotation plant was built at the Jack Waite Mine in 1926. This mill was enlarged in 1928. In 1930, the construction of a new 500-ton mill was started. The mill was destroyed by a fire in 1985 (IGS 1999).
Monarch Mill			
PrichCrkSeg03	1905- ???	Monarch Mining Company	A 75-ton mill was operating at the Monarch Mine by 1905. By 1910, the Monarch Mining Company had completed construction of a 200-ton concentration plant. This plant used rolls, jigs, a Huntington mill, Wilfrey tables, and Frue vanners (IGS 1999).
Mother Lode Mill			
PrichCrkSeg03	Unknown	Idaho Mother Lode Gold Mines, Inc.	There is some record of gold ore processing at the Mother Lode mine using a 5-stamp mill. Ores of the Mother Lode and Golden Chest mines were also treated in a 100-ton flotation plant during the 1930s (IGS 1999).

Table 2.1-2 (Continued)
Mills With Documented Operations in Prichard Creek Watershed

Segment	Operating Years	Ownership	Comments
Mountain Lion Mine Stamp Millsite			
PrichCrkSeg03	1925- ???	Mr. William Wylie, operated by the Kings Pass Gold Co. Inc. under a lease agreement.	Milling operations at the Mountain Lion Mine consisted of small capacity gold stamp mills. A 3-stamp mill was operated on the property in 1925. A 3-ton mill, which used stamps and amalgamation, was used during the 1930s. Later in the 1960s, a 5-stamp mill equipped with amalgamation plates was used (IGS 1999).
Cedar Creek Mill (Silver Strike)			
PrichCrkSeg03	1928-1933	Cedar Creek Mining Co., Silver Strike Mining Co.	A new 100-ton flotation plant was built to process the ores of the Cedar Creek Mine (later named the Silver Strike) about 1928. The mill was operated intermittently for the next several years and was then rented to the Golden Chest Mine for 2 months in 1933. The mill equipment was sold in 1952 (IGS 1999).

Table 2.2-1
Summary of Aquifer Parameters of the Smelterville Flats-Bunker Hill Upper Aquifer

Hydrostratigraphic Unit	Horizontal Hydraulic Conductivity (ft/day)	Vertical Hydraulic Conductivity (ft/day)	Transmissivity 2 (ft/day)	Storativity (unitless)	Effective Porosity
Upper Aquifer	500 - 10,790	0.0025[a]	10,002 - 216,852	0.0015 - 0.09	23.6 - 29.0

[a]Based on one test conducted on a sample of upper aquifer alluvium from borehole GR-26U at 13.5 feet below ground surface. No units given in original source document.

Source: MFG (1992)

Table 2.3.1-1
Summary of Discharge Data From Project Database
Segment PrichCrkSeg03

Segment Name	Location	Measured By	No. of Readings	Beginning Date	Ending Date	Minimum Discharge	Maximum Discharge	Units
PrichCrkSeg03	PR 14	URS, USGS	14	05/06/98	09/08/99	5	1170	cfs
PrichCrkSeg03	PR 16	URS	1	05/05/98	05/05/98	404	404	cfs
PrichCrkSeg03	PR 17	URS	1	05/06/98	05/06/98	178	178	cfs
PrichCrkSeg03	PR 18	URS	1	05/05/98	05/05/98	217	217	cfs
PrichCrkSeg03	PR 19	URS	1	05/06/98	05/06/98	29.7	29.7	cfs
PrichCrkSeg03	PR 20	URS	1	05/06/98	05/06/98	26.9	26.9	cfs
PrichCrkSeg03	PR 21	URS	1	05/08/98	05/08/98	21.4	21.4	cfs
PrichCrkSeg03	PR 22	URS	1	05/08/98	05/08/98	13.7	13.7	cfs
PrichCrkSeg03	PR 23	URS	1	05/09/98	05/09/98	254	254	cfs
PrichCrkSeg03	PR 24	URS	1	05/07/98	05/07/98	88.3	88.3	cfs
PrichCrkSeg03	PR 25	URS	1	05/07/98	05/07/98	270	270	cfs
PrichCrkSeg03	PR 26	URS	1	05/08/98	05/08/98	0.0422	0.0422	cfs
PrichCrkSeg03	PR 27	URS	1	05/09/98	05/09/98	231	231	cfs
PrichCrkSeg03	PR 28	URS	1	05/08/98	05/08/98	0.0005	0.0005	cfs
PrichCrkSeg03	PR 29	URS	1	05/09/98	05/09/98	216	216	cfs
PrichCrkSeg03	PR 30	URS	1	05/08/98	05/08/98	24.8	24.8	cfs
PrichCrkSeg03	PR 31	URS	1	05/10/98	05/10/98	189	189	cfs
PrichCrkSeg03	PR 32	URS	1	05/08/98	05/08/98	57.8	57.8	cfs
PrichCrkSeg03	PR 33	URS	1	05/10/98	05/10/98	127	127	cfs
PrichCrkSeg03	PR 34	URS	1	05/10/98	05/10/98	3.96	3.96	cfs
PrichCrkSeg03	PR 35	URS	1	05/10/98	05/10/98	70.1	70.1	cfs
PrichCrkSeg03	PR 36	URS	1	05/08/98	05/08/98	94.4	94.4	cfs
PrichCrkSeg03	PR 37	URS	1	05/10/98	05/10/98	3.13	3.13	cfs
PrichCrkSeg03	PR 38	URS	1	05/10/98	05/10/98	65.5	65.5	cfs
PrichCrkSeg03	PR 41	URS	1	05/09/98	05/09/98	21.8	21.8	cfs
PrichCrkSeg03	PR 42	URS	1	05/11/98	05/11/98	2.87	2.87	cfs
PrichCrkSeg03	PR 43	URS	1	05/11/98	05/11/98	16.7	16.7	cfs

Table 2.3.1-1 (Continued)
Summary of Discharge Data From Project Database
Segment PrichCrkSeg03

Segment Name	Location	Measured By	No. of Readings	Beginning Date	Ending Date	Minimum Discharge	Maximum Discharge	Units
PrichCrkSeg03	PR 44	URS	1	05/11/98	05/11/98	3.91	3.91	cfs
PrichCrkSeg03	PR 45	URS	1	05/12/98	05/12/98	2.13	2.13	cfs
PrichCrkSeg03	PR 46	URS	1	05/12/98	05/12/98	2.88	2.88	cfs
PrichCrkSeg03	PR 47	URS	1	05/12/98	05/12/98	1.68	1.68	cfs
PrichCrkSeg03	PR 48	URS	1	05/19/98	05/19/98	19	19	cfs
PrichCrkSeg03	PR 49	URS	1	05/19/98	05/19/98	16.2	16.2	cfs

Note:
cfs - cubic feet per second

Table 2.3.2-1
Estimated Recurrence Intervals, Prichard Creek

Recurrence Interval (Years)	Flood Insurance Study Prichard Creek below Eagle Creek Estimated Peak Flow (cfs)
2	not available
5	not available
10	3,850
25	not available
50	6,480
100	8,020

Note:
cfs - cubic feet per second

Table 2.3.2-2
Precipitation Summary and Discharge Comparison for Water Year 1999,
Wallace, Woodland Park, Idaho
NOAA Cooperative Station 109498

Climate Indicators	Monthly Totals												Annual Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Total Precipitation (in.)	1.2	9.7	6.9	4.7	6.9	3.5	0.7	0.9	1.8	0.2	3.0	0.3	39.8
Total Snowfall (in.)	0.0	6.3	8.7	18.9	26.4	21.3	0.6	0.0	0.0	0.0	0.0	0.0	82.2
Mean Monthly Discharge (cfs) (Prichard Creek)	18.0	50.5	126	211	111	402	482	634	483	118	41.1	22.4	225
Average Precipitation for Period of Record (in.)	2.9	4.9	5.2	5.0	3.9	3.4	2.8	2.7	2.6	1.3	1.4	1.9	37.7
Average Snowfall for Period of Record (in.)	0.5	8.3	22.6	24.0	15.0	10.5	2.5	0.3	0.0	0.0	0.0	0.0	83.7

Note:
cfs - cubic feet per second

3.0 SEDIMENT TRANSPORT PROCESSES

The physical processes of rain falling on soil, runoff from snowmelt or precipitation, channel bank and bed erosion, or mass movements incorporates sediment into streams of water. Water in streams transports, deposits, and sorts the delivered sediment based on the stream energy, discharge, and size and quantity of sediment.

Sediment transport by streams is a natural process; however, human activities such as mining, logging, road building, urbanization, or land clearing can significantly increase the rate at which sediment transport occurs. For instance, land clearing provides exposed soil and rock that may be subject to erosion. Further, this disturbance may decrease the amount of water storage in the soil, increasing runoff rates and providing additional surface water and energy for sediment transport.

The rate at which sediment passes through a cross section of a stream system is referred to as the sediment yield. For purposes of this report, sediment yield will be defined in units of tons per square mile per year. This annual sediment yield may be broken down into components that describe the method of transport, suspended load and bed load. Suspended load consists of particles small and light enough to be carried downstream in suspension by shear and eddy forces in the water column. Bed load consists of larger and heavier particles that move downstream by rolling sliding or hopping on the channel bed (Dunne and Leopold 1978).

All sediment motion downstream is dictated by the shear and gravitational forces acting at a given time and place within the channel. For sediment transport purposes, gravitational forces are essentially constant. Shear forces, however are dynamic through space and time and are dependent upon the location, depth of water, and slope of the water surface. Sediment transport occurs at even the smallest of stream channel discharge but the majority of movement occurs during moderate to high discharge when shear forces are greatest (Leopold et al. 1992).

Sediment derived in Prichard Creek is transported to the North Fork. Based on review of aerial photographs, likely sediment sources within the Prichard Creek Watershed are mining waste, mobilization of channel bed sediment, bank erosion, and some rock debris situated adjacent to channels. Logging and drill exploration roads may also provide a sediment source. In this discussion, the available information, analyses, and likely sediment sources are described.

3.1 AVAILABLE INFORMATION

For the Prichard Creek watershed, 1998 photographs by URS Greiner, Inc. (URSG) and CH2M HILL (URSG and CH2M HILL 1999) were reviewed. USGS sediment gaging data are not available for Prichard Creek; therefore, estimates of sediment yield are not included in this discussion.

3.2 ANALYSES

3.2.1 Channel Descriptions

The 1998 set of aerial photographs by URSG and CH2M HILL were reviewed to describe Prichard Creek. Photographic coverage of Prichard Creek exists from Eagle Creek to the upstream end of segment PrichCrkSeg03 and the upstream end of Eagle Creek, also in segment PrichCrkSeg03. This review and interpretation focused on morphologic features indicating stream instability, channel migration, channel aggregation or degradation and other features that may contribute sediment to the system.

Prichard Creek, upstream of the Eagle Creek confluence displays a multi-threaded, braided pattern indicating a high sediment load. The valley floor adjacent to the channel is 500 to 1,000 feet wide and is well vegetated with trees and other vegetation.

Approximately 1.9 miles upstream of the Eagle Creek confluence, deposits from the Prichard Creek Dredge Tailings have been placed on the north bank of the channel. From the photographs reviewed, Prichard Creek appears to flow adjacent to and between piles of spoil. The spoils fill much of the valley bottom not occupied by roads or the channel. Prichard Creek has a braided pattern in this reach. The dredge spoils continue upstream to the town of Murray. These spoils may be a sediment source to Prichard Creek where in contact with the creek.

Upstream of Murray to the confluence with Butte Gulch, the channel is constrained by hillslopes on the south and road embankments on the north. Logging and exploration drill roads criss cross the hillslopes above Prichard Creek. Additional dredge spoils appear to have been placed in discrete areas along the channel through this section.

Upstream of Butte Gulch, the channel is constrained by hillslopes and road embankments. Additional dredge spoils have been placed adjacent to the channel at the mouth of Bear Gulch.

Upstream of Bear Gulch to the upstream end of segment PrichCrkSeg03, Prichard Creek has a multi-threaded braided pattern with relict channels visible in the photographs reviewed.

In the upstream portion of Eagle Creek likely sediment sources include logging and drill exploration roads. Additionally, a deposit of rock debris is situated adjacent to the channel at Duthie in Tributary Creek.

3.3 SUMMARY

The Prichard Creek Watershed appears to have few sediment sources. Likely sediment sources include channel bed remobilization and minor bank erosion. In addition, sediment from the Prichard Creek dredge tailings in contact with surface water and Prichard Creek are sources of sediment to Prichard Creek. These appear less significant than other areas in the Coeur d'Alene River Basin.

These observations were based on a limited review of the available data, photographs, and topographic maps at the time of review. Not all potential sediment sources were identified, as potential sediment sources literally cover the entire watershed. Primary sources were identified based on review of the available information.

4.0 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination and mass loading in the three segments of the Prichard Creek watershed are discussed in this section. Section 4.1 describes chemical concentrations found in environmental media, including horizontal and vertical extent. For each watershed segment, the discussion includes remedial investigation data chemical analysis results; comparison of chemical results to selected screening levels; and focused analysis of identified source areas. In Section 4.2, preliminary estimates of mass loading are presented.

4.1 NATURE AND EXTENT

The nature and extent of the ten metals of potential concern identified in Part 1, Section 5.1 (antimony, arsenic, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc) in surface soil, subsurface soil, sediment, groundwater and surface water are discussed in this section. Locations with metals detected in any matrix at concentrations 1 times (1x), 10 times (10x) and 100 times (100x) the screening level were identified and presented in the following data summary tables. The magnitudes of exceedance (10x and 100x) were arbitrarily selected to delineate areas of contamination. Metals identified in this evaluation are further evaluated in either the human health or ecological risk assessments (under separate cover).

Historical and recent investigations at areas within the study area are listed and summarized in Part 1, Section 4. Data source references are included as Attachment 1. Chemical data collected in Prichard Creek and used in this evaluation are presented in Attachment 2. Data summary tables include sampling location, data source reference, collection date, depth, and reported concentration. Screening level exceedances are highlighted. Sampling locations are shown on Figures 4.1-1 through 4.1-8.

The nature and extent of contamination were evaluated by screening chemical results against applicable risk-based screening criteria and available background concentrations. Screening levels are used in this analysis to identify source areas and media (e.g., soil, sediment, groundwater, and surface water) of concern that will be evaluated in the feasibility study (FS).

Statistical summaries for each metal in surface soil, subsurface soil, sediment, groundwater, and surface water are included as Attachment 3 and discussed in the subsections below. The summaries include the number of samples analyzed; the number of detections; the minimum and maximum detected concentrations; the average and coefficient of variation; and the screening level (SL) to which the detected concentration is compared. Proposed screening levels were compiled from available federal numeric criteria (e.g., National Ambient Water Quality Criteria), regional preliminary remediation goals (PRGs) (e.g., EPA Region IX PRGs), regional baseline or background studies for soil, sediment and surface water and other guidance documents (e.g., National Oceanographic and Atmospheric Administration freshwater sediment screening values). The screening level selection process is discussed in detail in Part 1, Section 5.1.

Source areas within Prichard Creek are presented in Tables 4.1-1 through 4.1-3. These sites are based on source areas initially identified by the BLM (1999) and further refined during the RI/FS process. The tables include source area names, source ID, source area acres, description, number of samples by matrix type, and metals exceeding 1x, 10x and 100x the screening levels in surface soil, subsurface soil, sediment, groundwater and surface water.

It should be noted that the number of samples identified for each source area was determined using the project Geographical Information System. Only sampling locations located within a source area polygon (shown on Figures 4.1-1 through 4.1-8) are included in Tables 4.1-1 through 4.1-3; therefore, there may be samples collected from source areas and listed in the data summary tables in Attachment 2 that are not accounted for in Tables 4.1-1 through 4.1-3.

The following sections present segment-specific sampling efforts and results according to matrix type. Given the extensive geographic range of the Coeur d'Alene Basin, sampling efforts were focused on areas of potential concern; therefore, more samples were collected from known mining-impacted areas near the creek, than from other areas within the watershed.

4.1.1 Segment PrichCrkSeg01

4.1.1.1 Surface Soil

One surface soil sample from segment PrichCrkSeg01 was collected and analyzed for total metals. Zinc was detected at a concentration greater than 10x the screening level.

4.1.1.2 Surface Water

Two surface water samples for total metals and one for dissolved metals were collected and analyzed in segment PrichCrkSeg01. Copper and zinc were detected at concentrations greater than 10x the screening levels for total metals. Cadmium and zinc were detected at concentrations greater than 10x the screening levels for dissolved metals.

4.1.1.3 Identified Source Areas

Chemical data for surface soil, subsurface soil, sediment, groundwater, and surface water were reviewed together to identify source areas within segment PrichCrkSeg01 that may be significant contributors of metals to Prichard Creek. Summary source area data are presented in Table 4.1-1.

One of the five source areas in this segment was sampled for surface soil and surface water. Chemical concentrations for cadmium, copper, and zinc were greater than 10x the screening level in surface soil and surface water.

4.1.2 Segment PrichCrkSeg02

4.1.2.1 Surface Soil

Two surface soil samples were collected from a depth of 0 to 0.5 feet and analyzed for total metals. Cadmium, lead and zinc were found at concentrations exceeding 10x the screening levels. Concentrations of lead and zinc were also found at greater than 100x the screening levels.

4.1.2.2 Surface Water

Four surface water samples for total metals and two for dissolved metals were collected and analyzed in segment PrickCrkSeg02. The concentration of total zinc exceeded 10x the screening level at one location. Concentrations of dissolved lead and zinc detected in the surface water exceeded 10x the screening levels.

4.1.2.3 Identified Source Areas

Chemical data for surface soil, subsurface soil, sediment, groundwater, and surface water were reviewed together to identify source areas within segment PrichCrkSeg02 that may be significant contributors of metals to Prichard Creek. Summary source area data are presented in Table 4.1-2.

Two of the nine source areas in this segment were sampled for surface soil and surface water. Bear Gulch Unnamed Millsite displayed concentrations of lead and zinc that exceeded 100x the screening levels. Concentrations of total and dissolved zinc at the Silver Crystal source area exceeded 10x the screening levels.

4.1.3 Segment PrichCrkSeg03

4.1.3.1 Surface Soil

Nine surface soil samples were collected from a depth of 0 to 0.5 feet and analyzed for total metals. Arsenic, cadmium, lead and zinc were detected at concentrations greater than 10x the screening levels. Arsenic and zinc were also detected in the surface soil of segment PrichCrkSeg03 at concentrations that exceeded 100x the screening levels.

4.1.3.2 Surface Water

Eighty-nine surface water samples for total metals and 77 surface water samples for dissolved metals in PrichCrkSeg03 were collected and analyzed. Sampling results for total metals indicate concentrations of copper, iron, lead, manganese and zinc exceeded 10x the screening level. Copper was also detected in one sample at a concentration greater than 100x the screening level.

Sampling results for dissolved metals show concentrations of cadmium, copper, lead, manganese and zinc at concentrations in excess of 10x the screening levels.

4.1.3.3 Identified Source Areas

Chemical data for surface soil, subsurface soil, sediment, groundwater, and surface water were reviewed together to identify source areas within segment PrichCrkSeg03 that may be significant contributors of metals to Prichard Creek. Summary source area data are presented in Table 4.1-3.

Thirteen of the 44 source areas in segment PrichCrkSeg03 were sampled for surface soil and/or surface water. Arsenic, cadmium, copper, lead and zinc were detected in surface soil of multiple sites at concentrations greater than 10x the screening level. In addition, samples collected at Paragon Lower Millsite show two concentrations of zinc that exceeded 100x the screening level; samples collected at Silver Strike Mine show one concentration of arsenic that exceeded 100x the screening level; and samples collected at Prichard Creek Impacted Floodplain showed a concentration of zinc that exceeded 100x the screening level.

4.2 SURFACE WATER MASS LOADING

In Part 1 of this report (Setting and Methodology, Section 5.3.1), the concept of mass loading and its use in the remedial investigation was presented. Section 4.2 of the Canyon Creek Nature and Extent further discussed the use of plotting discrete sampling event versus the probabilistic analysis of the mass loading data in fate and transport.

The Prichard Creek Watershed has limited data by which to assess mass loading in surface water or groundwater. Stream sampling conducted in May 1998 was the most comprehensive and is summarized in Table 4.2-1. Additional sampling was conducted on Prichard Creek near the confluence with the North Fork (PR14) and is also summarized in the table.

The order of sampling locations on Prichard Creek listed in Table 4.2-1 is from upstream to downstream. Mass loading from side streams is listed from upstream to downstream in the order the mass load would be introduced into Prichard Creek. The additional PC14 data near the mouth of Prichard Creek is listed in order of increasing flow. Figures 4.1-7 and 4.1-8 show the surface water sampling locations that are listed in Table 4.2-1.

As shown in Table 4.2-1, the May 1998 sampling event took place over a period of several days. This makes it difficult to assess changes in mass loading from potential mine sources located in the watershed. However, regarding mass loading, the following general observations can be made.

1. Based on a base flow of 15 to 20 cubic feet per second (Section 2.2), the May 1998 event probably represents a moderately high-flow event. Sampling location PR14 probably represents the mass load in surface water discharging to the North Fork. The total lead loading at this location ranged from less than 1 pound per day to 158 pounds per day. The dissolved zinc loading ranged from 6 pounds per day to 180 pounds per day.

2. During the May 1998 event, overall lead loading in Prichard Creek was low and did not exceed 3 pounds per day. The zinc loading increased steadily from 13 pounds per day (PR36, upstream) to 67 pounds per day (PR16, downstream). Two measurements appear skewed, PR24 and PR14. The flow and corresponding zinc load at these sampling locations decrease relative to the next upstream sampling location. The flows appear inconsistent and may reflect difficulties in obtaining measurements.

3. Tributary Creek, a tributary to East Fork Eagle Creek, has 7 pounds per day of lead loading (PR22) and 45 pounds per day of zinc loading (PR21) near the headwaters during the May sampling. Downstream at sampling location PR48, the lead load decreases to 2 pounds per day and less than measurable for zinc.

4. Sampling location PR18 is the furthest downstream sampling location on West Fork Eagle Creek prior to the confluence with Prichard Creek. Lead loading at this location was 3 pounds per day and zinc loading was 62 pounds per day. This loading would include load contributed by the East Fork Eagle Creek (including Tributary Creek).

5. Loading measured in other tributaries did not appear to add substantial load to Prichard Creek.

6. Potential sources for observed loading in the Prichard Creek Watershed include unknown sources on Tributary Creek and floodplain sediments mapped by the BLM along Prichard Creek.

Regarding groundwater, information was not available to evaluate potential mass loading. However, the section of Prichard Creek between sampling locations PR 33 and PR24 has a developed floodplain. The floodplain is identified as a source of mine tailings. The USGS seepage study in Canyon Creek demonstrated that where stream systems widen and a floodplain develops, an exchange of mass load between surface water and groundwater could occur (URSG 2000). There is a potential for such an exchange in Prichard Creek.

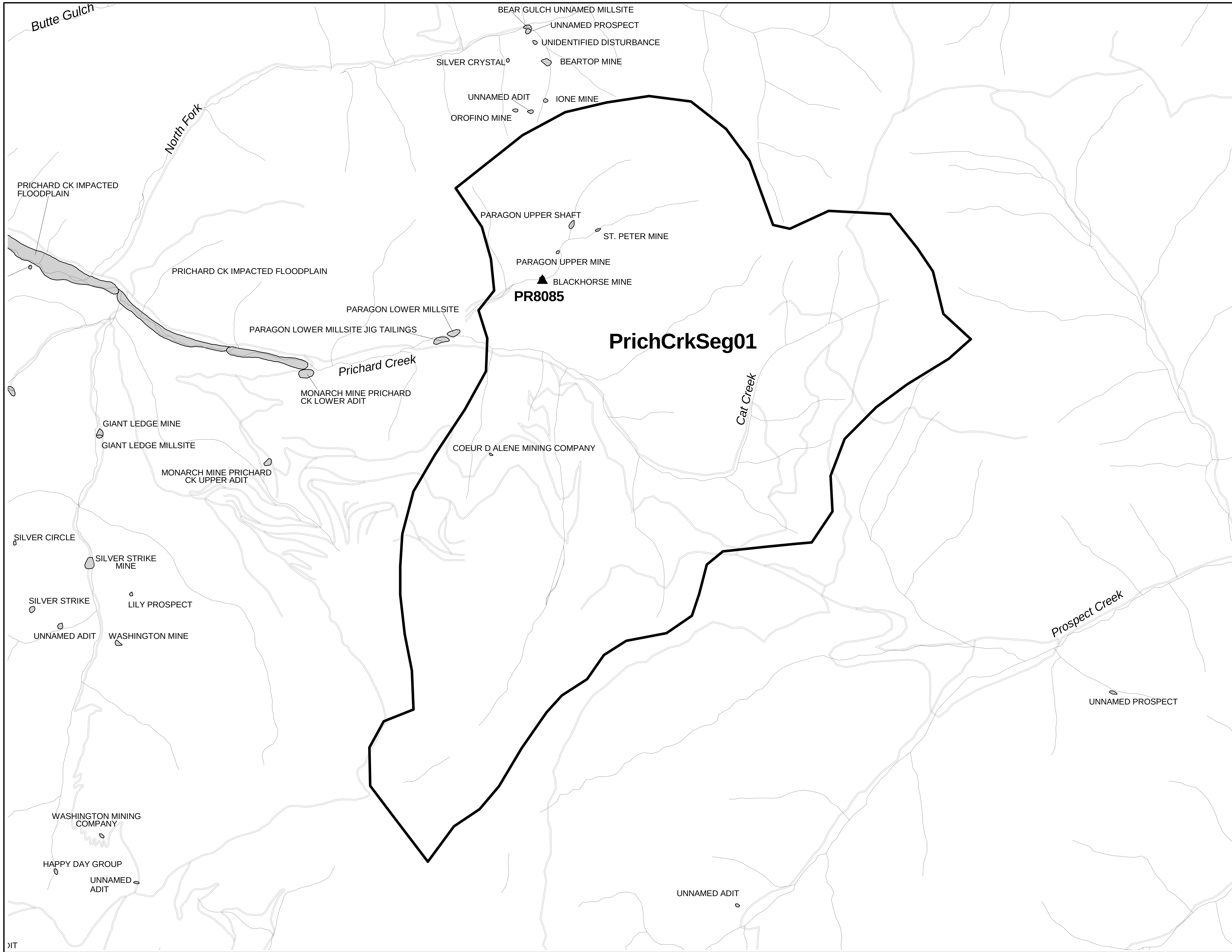
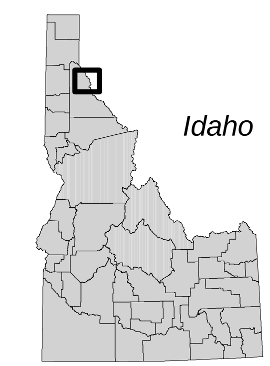


Figure 4.1-1
Prichard Creek Segment PrichCrkSeg01 Source Areas and Soil/Sediment Sampling Locations

LEGEND

- ▲ Tailings Sampling Location
- Stream
- Road
- ★ City
- Prichard Creek Segment 1
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:36,000

0 0.5 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Prichard_Creek
\prichard_3-29.apr
V: PrichSeg1 Soil
E:soil
L: Final RI PrichSeg01 Soil
7/11/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

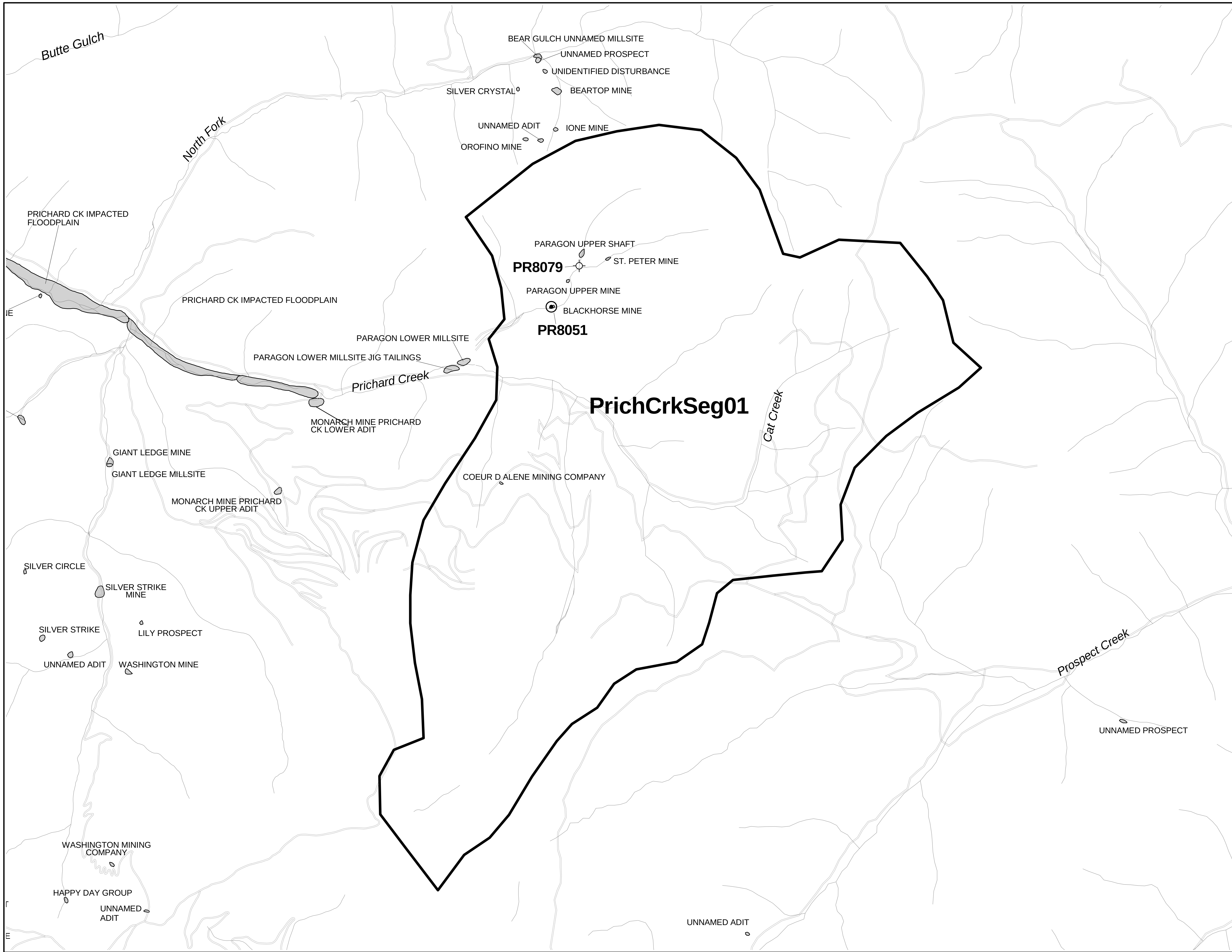
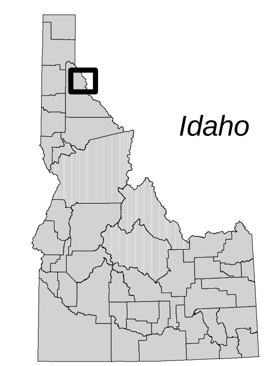


Figure 4.1-2
Prichard Creek Segment PrichCrkSeg01 Source Areas and Surface Water Sampling Locations

LEGEND

- Adit Sampling Location
- River Sampling Location
- Stream
- Road
- City
- Prichard Creek Segment 1
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:36,000

0 0.5 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

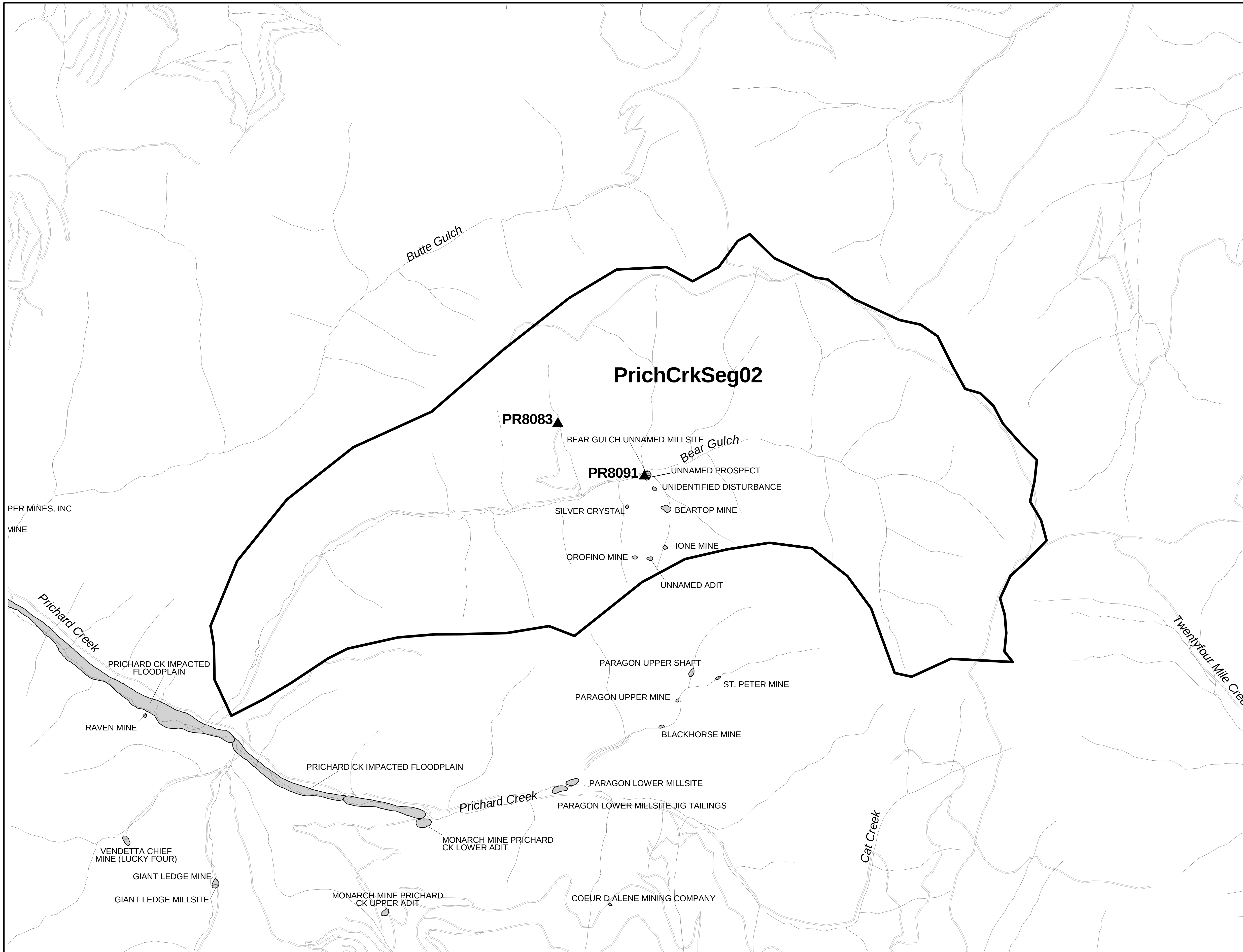
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Prichard_Creek\prichard_3-29.apr
V: PrichCrkSeg01 surface water
E: surface water
L: Final RI PrichCrkSeg01 SW
7-11-01

This Map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983

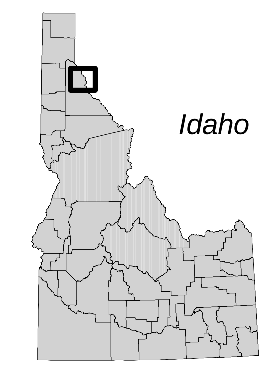
Date of Plot: July 11, 2001

Figure 4.1-3
Prichard Creek Segment PrichCrkSeg02
Source Areas and Soil/Sediment Sampling Locations



LEGEND

- ▲ Tailings Sampling Location
- Stream
- Road
- ★ City
- Prichard Creek Segment 2
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:36,000

0 0.5 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

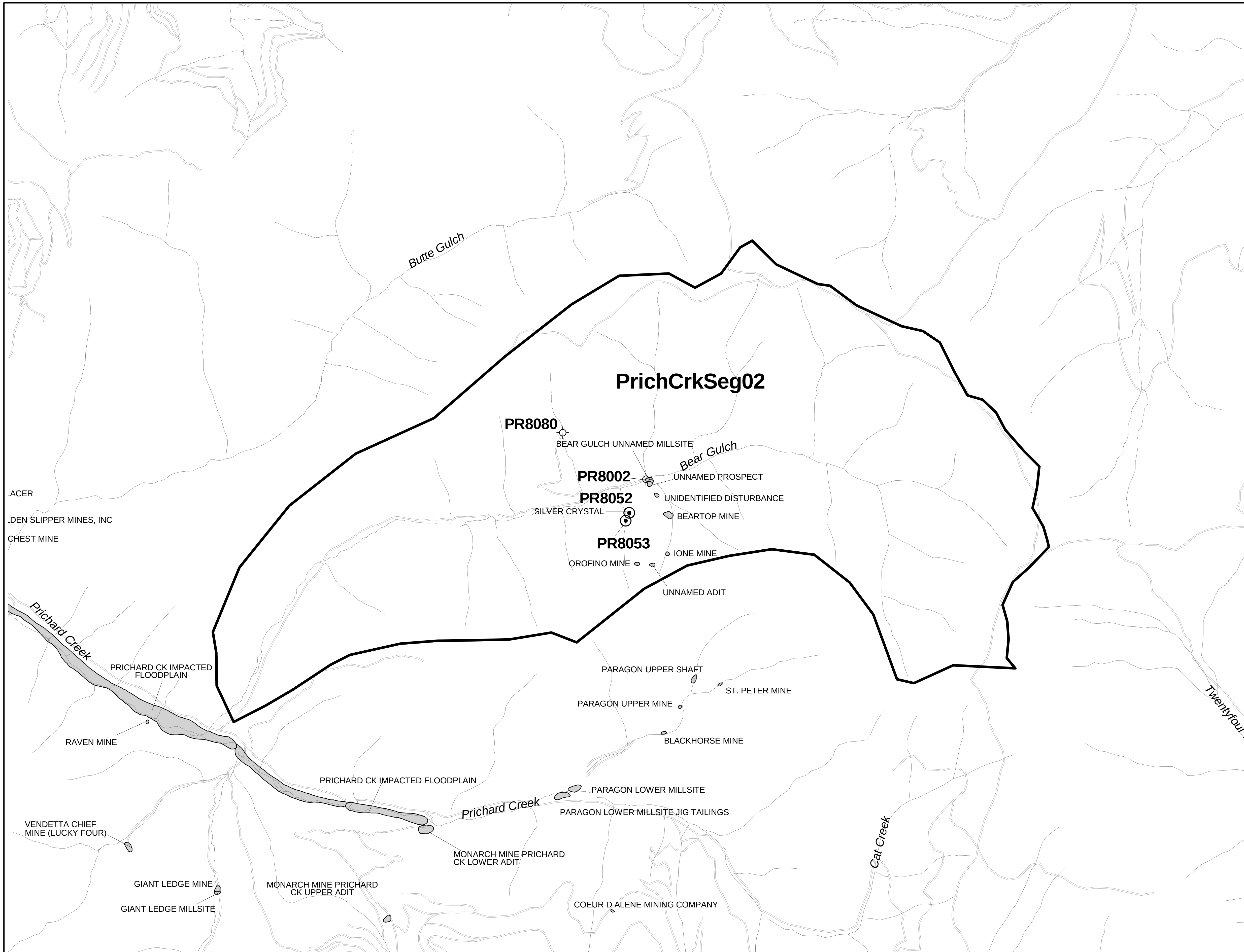
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\prichard_creek\prichard_3-29.apr
V: PrichSeg02 soil
E:SOIL
L: Final RI PrichSeg02 soil
7/11/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

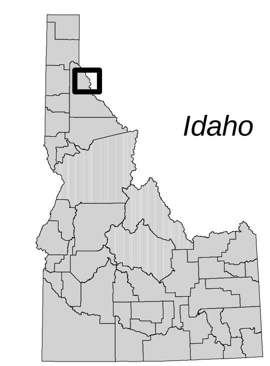
Date of Plot: July 11, 2001

Figure 4.1-4
Prichard Creek Segment PrichCrkSeg02
Source Areas and Surface Water Sampling Locations



LEGEND

- River Sampling Location
- Adit Sampling Location
- Stream
- Road
- City
- Prichard Creek Segment 2
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:36,000

0 0.5 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\prichard_creek
\prichard_3-29.apr
V: PrichSeg02 SW
E: SW
L: Final RI PrichSeg02 SW
7/11/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

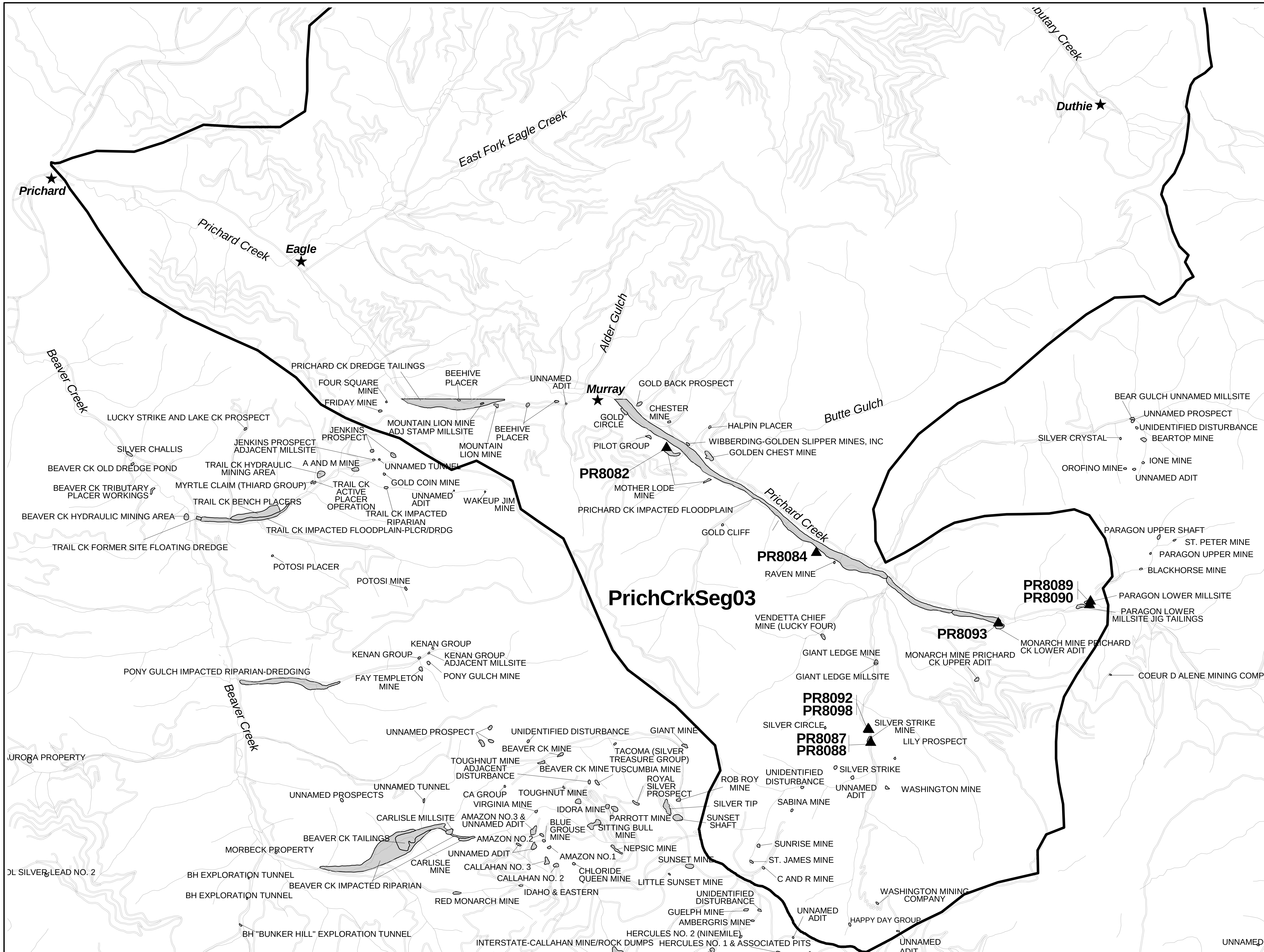
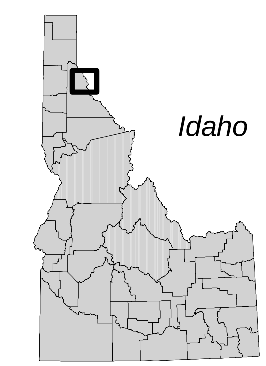


Figure 4.1-5
Prichard Creek Segment PrichCrkSeg03 Northern Half Source Areas and Soil/ Sediment Sampling Locations

LEGEND

- ▲ Tailings Sampling Location
- Stream
- Road
- ★ City
- Prichard Creek Segment 3
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:60,000

0 0.5 1 Miles

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

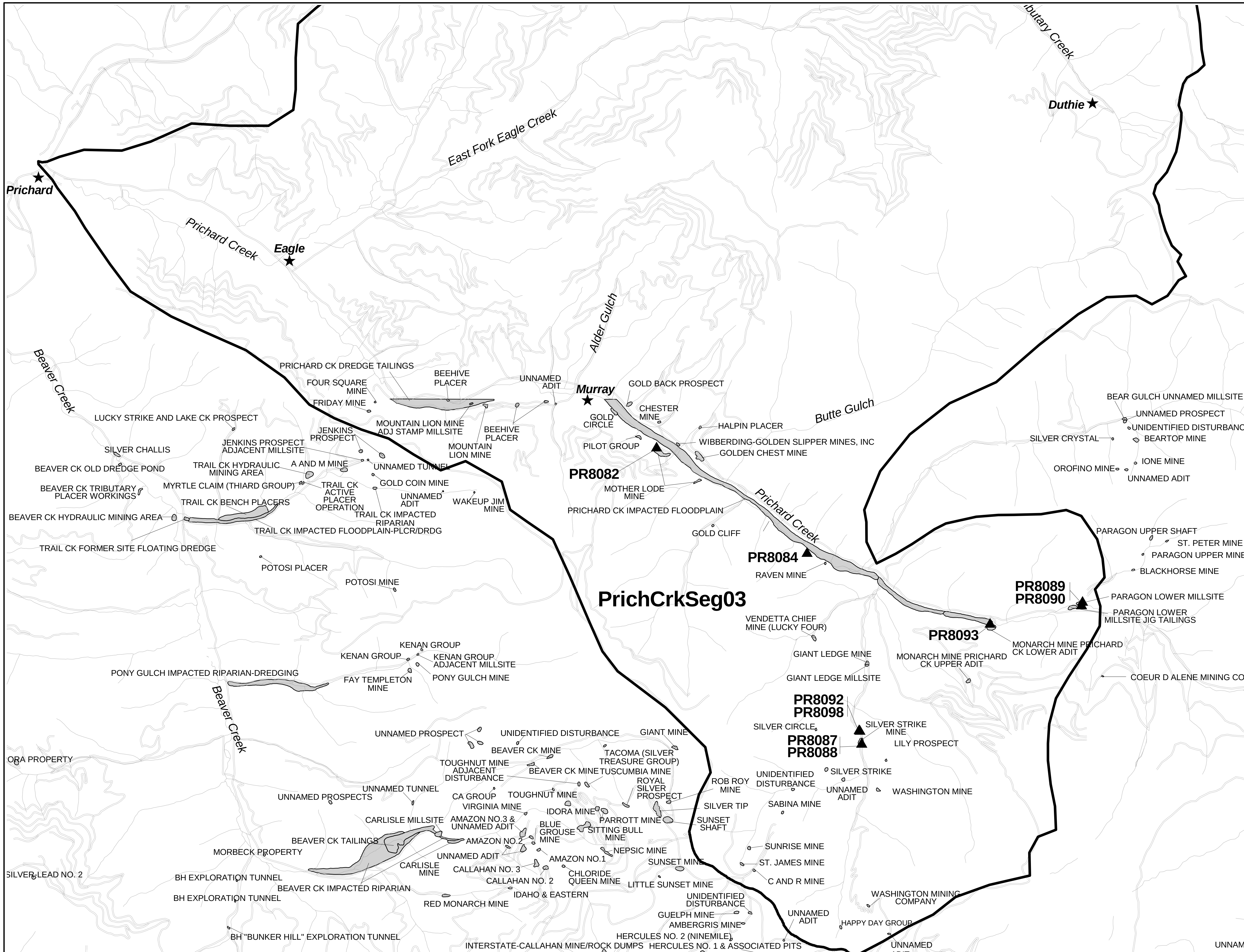
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Prichard_Creek
|prichard_3-29.apr
V: Prichard Creek Segment 03 Soil
E:northern half
L: Final RI PrichSeg03 Northern Soil
7/11/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

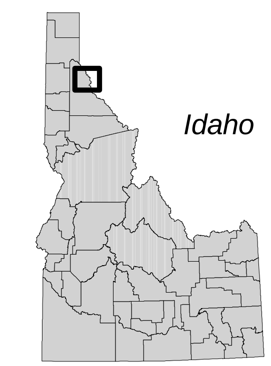
Date of Plot: July 11, 2001

Figure 4.1-6
Prichard Creek Segment PrichCrkSeg03 Southern Half Source Areas and Soil/Sediment Sampling Locations



LEGEND

- ▲ Tailings Sampling Location
- Stream
- Road
- ★ City
- Prichard Creek Segment 3
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:60,000

0 0.5 1 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

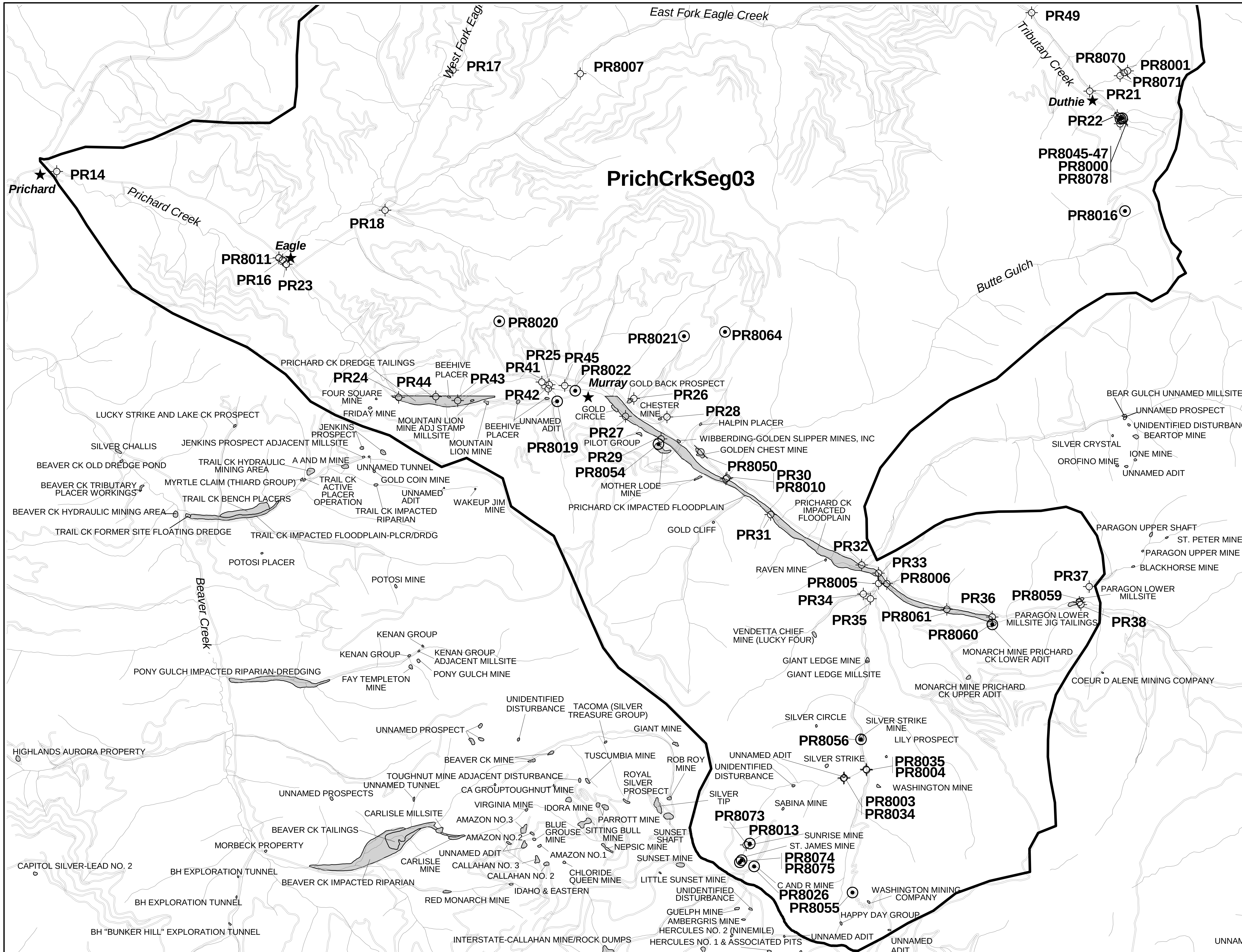
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Prichard_Creek
|prichard_3-29.apr
V: Prichard Creek Segment 03 Soil
E: southern half
L: Final RI PrichSeg03 south Soil
7/11/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

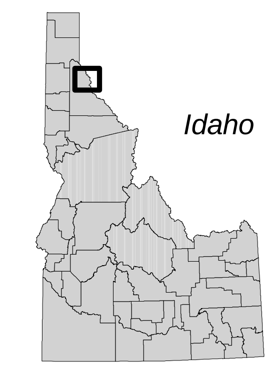
Date of Plot: July 11, 2001

Figure 4.1-7
Prichard Creek Segment PrichCrkSeg03 Northern Half Source Areas and Surface Water Sampling Locations



LEGEND

- Adit Sampling Location
- Seep Sampling Location
- River Sampling Location
- Stream
- Road
- City
- Prichard Creek Segment 3
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:60,000

0 0.5 1 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Prichard_Creek|
prichard_3-29.apr
V: Prichard Northern Half
E:Northern Half
L: Final RI PrichSeg03 northern SW
7/11/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

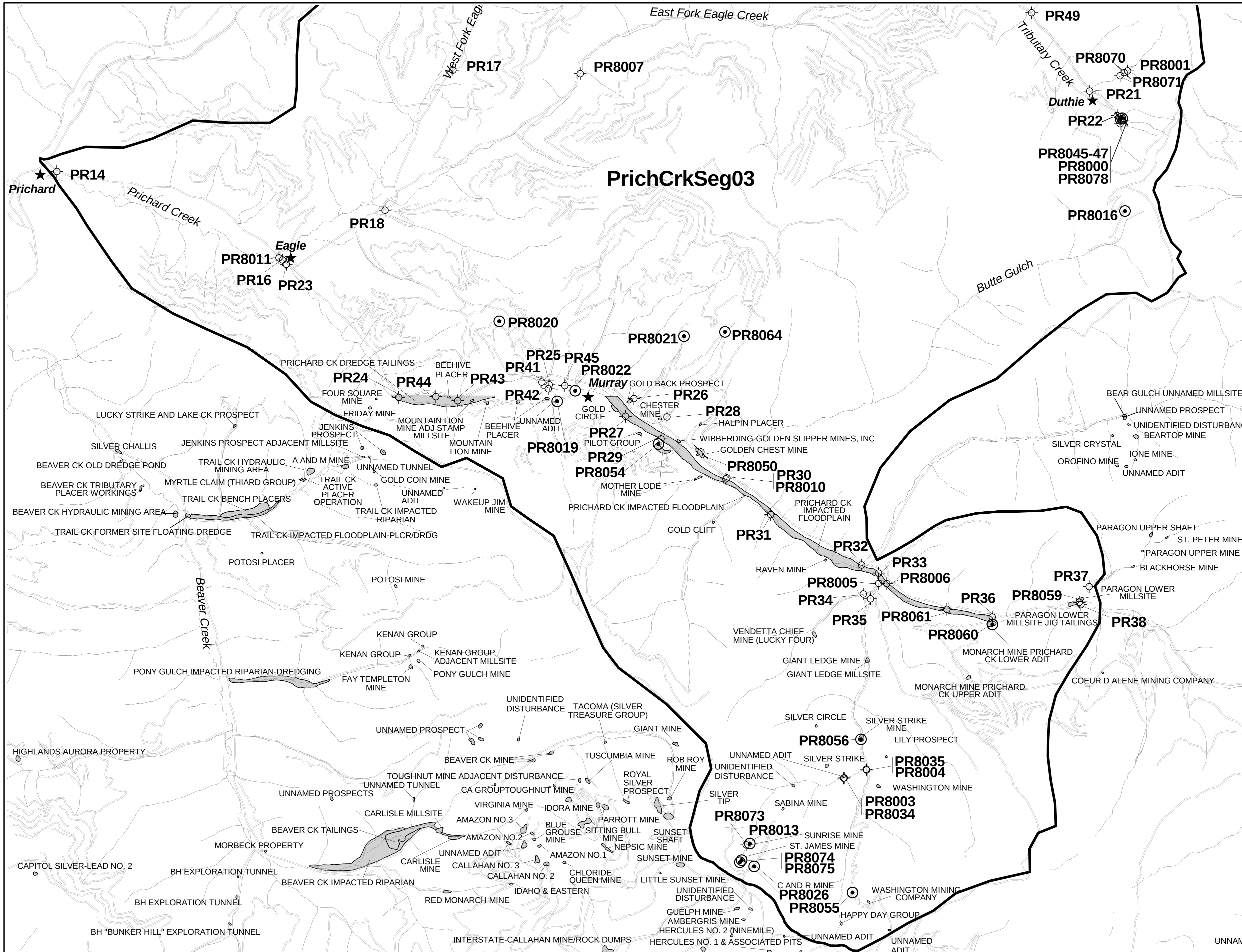
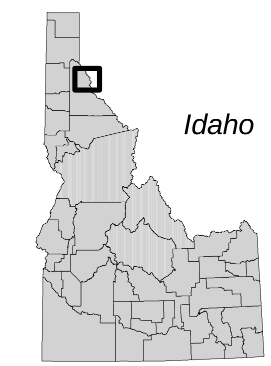


Figure 4.1-8
Prichard Creek Segment PrichCrkSeg03 Southern Half Source Areas and Surface Water Sampling Locations

LEGEND

- Adit Sampling Location
- Seep Sampling Location
- River Sampling Location
- Stream
- Road
- City
- Prichard Creek Segment 3
- Source Area and Name



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner, Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling locations obtained from URS Greiner, Inc. Technical Data Management database as of 3/29/00.

SCALE 1:60,000

0 0.5 1 Miles

N

027-RI-CO-102Q
Coeur d' Alene Basin RI/FS
RI REPORT

EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
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V: Prichard Northern Half
E:Southern Half
L: Final RI PrichSeg03 southern SW
7/11/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

Table 4.1-1
Potential Source Areas Within Prichard Creek - segment PrichCrkSeg01

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type	Metals > 1X	Metals > 10X	Metals > 100X
BLACKHORSE MINE	THO034	0.27	Floodplain Waste Rock (Above Cataldo No.& So.Fork)	SL 1 SW 1	SST: As-1, Cd-1, Pb-1 SWD: Cu-1, Pb-1 SWT: Cd-1	SST: Zn-1 SWD: Cd-1, Zn-1 SWT: Cu-1, Zn-1	
COEUR D ALENE MINING COMPANY	THO010	0.14					
PARAGON UPPER MINE	THO009	0.17	Upland waste rock				
PARAGON UPPER SHAFT	THO035	0.64	Floodplain Waste Rock (Above Cataldo No.& So.Fork)				
ST. PETER MINE	THO008	0.23	Floodplain Waste Rock (Above Cataldo No.& So.Fork)				

Matrix Types

DR: Debris/Rubble
GW: Groundwater
RK: Rock/Cobbles/Gravel
SB: Subsurface Soil
SD: Sediment
SL: Soil
SS: Surface Soil
SW: Surface Water

Matrix Groupings

GWD: Groundwater - Dissolved Metals
GWT: Groundwater - Total Metals
SBT: Subsurface Soil
SDT: Sediment
SST: Surface Soil
SWD: Surface Water - Dissolved Metals
SWT: Surface Water - Total Metals

Analytes

Ag: Silver
As: Arsenic
Cd: Cadmium
Cu: Copper
Fe: Iron
Hg: Mercury
Mn: Manganese
Pb: Lead
Sb: Antimony
Zn: Zinc

Table 4.1-2
Potential Source Areas Within Prichard Creek - segment PrichCrkSeg02

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
BEAR GULCH UNNAMED MILLSITE	THO036	0.59	Upland Concentrates and Process Wastes	SL SW	1 1	SST: As-1, Cu-1	SST: Cd-1	SST: Pb-1, Zn-1
BEARTOP MINE	THO004	1.03	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
IONE MINE	THO005	0.29	Floodplain Waste Rock (Above Cataldo No.& So.Fork) Mine Workings/Water, Seeps, Springs and Leachate					
OROFINO MINE	THO007	0.30	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock					
SILVER CRYSTAL	THO003	0.20	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock	SW	1	SWD: Cu-1, Pb-1 SWT: Cd-1, Pb-1	SWD: Zn-1 SWT: Zn-1	
UNIDENTIFIED DISTURBANCE	THO002	0.30						
UNNAMED ADIT	THO006	0.35						
UNNAMED ADIT	THO033	0.62						
UNNAMED PROSPECT	THO001	0.46						

Matrix Types

DR: Debris/Rubble	SD: Sediment
GW: Groundwater	SL: Soil
RK: Rock/Cobbles/Gravel	SS: Surface Soil
SB: Subsurface Soil	SW: Surface Water

Matrix Groupings

GWD: Groundwater - Dissolved Metals	SST: Surface Soil
GWT: Groundwater - Total Metals	SWD: Surface Water - Dissolved Metals
SBT: Subsurface Soil	SWT: Surface Water - Total Metals
SDT: Sediment	

Analytes

Ag: Silver	Hg: Mercury
As: Arsenic	Mn: Manganese
Cd: Cadmium	Pb: Lead
Cu: Copper	Sb: Antimony
Fe: Iron	Zn: Zinc

Table 4.1-3
Potential Source Areas Within Prichard Creek - segment PrichCrkSeg03

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
BEEHIVE PLACER	BUR001	0.69	Floodplain Waste Rock (Above Cataldo No.& So.Fork) Mine Workings/Water, Seeps, Springs and Leachate					
BEEHIVE PLACER	BUR002	0.47	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
BEEHIVE PLACER	OSB113	0.27	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
C AND R MINE	BUR080	0.30	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock	SW	2	SWD: Cu-1	SWD: Cd-1	
CHESTER MINE	BUR009	0.34	Upland waste rock					
FOUR SQUARE MINE	OSB110	0.16	Upland waste rock					
FRIDAY MINE	OSB011	0.43	Upland waste rock					
GIANT LEDGE MILLSITE	BUR157	0.34	Upland Concentrates and Process Wastes					
GIANT LEDGE MINE	BUR017	0.66	Upland waste rock					
GOLD BACK PROSPECT	BUR008	1.02	Floodplain Waste Rock (Above Cataldo No.& So.Fork) Mine Workings/Water, Seeps, Springs and Leachate					
GOLD CIRCLE	BUR003	1.33	Upland waste rock					
GOLD CLIFF	BUR007	0.25	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
GOLDEN CHEST MINE	BUR011	2.88	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock	SW	1	SWD: Cu-1, Mn-1, Zn-1 SWT: Fe-1, Mn-1	SWT: Zn-1	
HALPIN PLACER	BUR012	0.31	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
HAPPY DAY GROUP	BUR103	0.35	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
LILY PROSPECT	BUR019	0.20	Upland waste rock					
MONARCH MINE PRICHARD CK LOWER ADIT	BUR015	2.37	Upland waste rock	SW	1	SWD: Cu-1 SWT: Cd-1, Pb-1	SWD: Cd-1, Pb-1, Zn-1 SWT: Zn-1	
MONARCH MINE PRICHARD CK UPPER ADIT	BUR016	0.81	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock					

Table 4.1-3
Potential Source Areas Within Prichard Creek - segment PrichCrkSeg03

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
MOTHER LODE MINE	BUR005	4.34	Floodplain Waste Rock (Above Cataldo No.& So.Fork) Mine Workings/Water, Seeps, Springs and Leachate	SL SW	1 1	SST: Cd-1, Cu-1, Fe-1, Zn-1 SWD: Mn-1 SWT: As-1, Cd-1, Mn-1	SST: As-1, Pb-1 SWD: Cu-1, Pb-1, Zn-1 SWT: Cu-1, Pb-1, Zn-1	
MOTHER LODE MINE	BUR006	0.76	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
MOUNTAIN LION MINE	OSB112	0.73	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock					
MOUNTAIN LION MINE ADJ STAMP MILLSITE	OSB111	0.27	Upland Concentrates and Process Wastes					
PARAGON LOWER MILLSITE	BUR156	1.36	Upland Concentrates and Process Wastes	SL	2	SST: As-2, Cu-2	SST: Cd-2, Pb-2	SST: Zn-2
PARAGON LOWER MILLSITE JIG TAILINGS	BUR155	1.71	Upland Concentrates and Process Wastes					
PILOT GROUP	BUR004	0.65	Upland waste rock					
PRICHARD CK DREDGE TAILINGS	OSB012	45.55	Floodplain tailings (above Cataldo No.& So. Fork)	SW	3	SWD: Zn-3 SWT: Zn-3		
PRICHARD CK IMPACTED FLOODPLAIN	BUR013	130.26	Floodplain sediments (above Cataldo No.& So. Fork)	SW	3	SWD: Pb-3, Zn-2 SWT: Zn-3		
PRICHARD CK IMPACTED FLOODPLAIN	BUR014	13.31	Floodplain sediments (above Cataldo No.& So. Fork)	SL SW	1 1	SST: As-1, Cu-1 SWD: Cu-1 SWT: Cd-1, Pb-1	SST: Cd-1, Pb-1 SWD: Cd-1, Pb-1, Zn-1 SWT: Zn-1	SST: Zn-1
PRICHARD CK IMPACTED FLOODPLAIN	BUR152	20.48	Floodplain sediments (above Cataldo No.& So. Fork)	SW	2	SWD: Pb-1, Zn-1 SWT: Zn-2		
RAVEN MINE	BUR206	0.20	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					
SABINA MINE	BUR025	0.30	Upland waste rock					
SILVER CIRCLE	BUR022	0.22	Upland waste rock					
SILVER STRIKE	BUR023	0.60	Upland waste rock					
SILVER STRIKE MINE	BUR021	1.84	Floodplain Waste Rock (Above Cataldo No.& So.Fork) Mine Workings/Water, Seeps, Springs and Leachate	SL SW	2 1	SST: As-1, Cd-1, Cu-1, Fe-1 SWD: Cu-1, Zn-1 SWT: Zn-1	SST: Pb-1, Zn-1	SST: As-1
ST. JAMES MINE	BUR078	0.48	Floodplain Waste Rock (Above Cataldo No.& So.Fork) Mine Workings/Water, Seeps, Springs and Leachate	SW	1	SWD: Cu-1	SWD: Cd-1	
SUNRISE MINE	BUR079	0.54	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock	SW	1	SWD: Cu-1 SWT: Cd-1	SWD: Cd-1	

Table 4.1-3
Potential Source Areas Within Prichard Creek - segment PrichCrkSeg03

Source Area Name	Source ID	Area (Acres)	Source Description	No. Samples By Matrix Type		Metals > 1X	Metals > 10X	Metals > 100X
UNIDENTIFIED DISTURBANCE	BUR024	0.36						
UNNAMED ADIT	BUR154	0.17		SW	2	SWT: Cd-1	SWD: Cd-1	
UNNAMED ADIT	BUR159	0.53						
UNNAMED ADIT	BUR181	0.22						
VENDETTA CHIEF MINE (LUCKY FOUR)	BUR018	1.01	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock					
WASHINGTON MINE	BUR020	0.52	Upland waste rock					
WASHINGTON MINING COMPANY	BUR104	0.28	Mine Workings/Water, Seeps, Springs and Leachate Upland waste rock					
WIBBERDING-GOLDEN SLIPPER MINES, INC	BUR010	0.41	Floodplain Waste Rock (Above Cataldo No.& So.Fork)					

Matrix Types

DR: Debris/Rubble
GW: Groundwater
RK: Rock/Cobbles/Gravel
SB: Subsurface Soil
SD: Sediment
SL: Soil
SS: Surface Soil
SW: Surface Water

Matrix Groupings

GWD: Groundwater - Dissolved Metals
GWT: Groundwater - Total Metals
SBT: Subsurface Soil
SDT: Sediment
SST: Surface Soil
SWD: Surface Water - Dissolved Metals
SWT: Surface Water - Total Metals

Analytes

Ag: Silver
As: Arsenic
Cd: Cadmium
Cu: Copper
Fe: Iron
Hg: Mercury
Mn: Manganese
Pb: Lead
Sb: Antimony
Zn: Zinc

Table 4.2-1
Mass Loading Prichard Creek

						Total Lead		Dissolved Zinc	
Location	Sample No.	Segment No.	Sample Type	Sample Date	Flow (CFS)	Conc. (µg/L)	Load (lbs/day)	Conc. (µg/L)	Load (lbs/day)
Prichard Creek									
PR38	46425	3	RV	10-May-98	65.5	-	-	4 J	-
PR36	46416	3	RV	08-May-98	94.4	0.8	0	25	13
PR33	46422	3	RV	10-May-98	127	3.6	2	52.3	36
PR31	46421	3	RV	10-May-98	189	2.7 J	-	75.6	77
PR29	46420	3	RV	09-May-98	216	2.3	3	47.5	55
PR27	46419	3	RV	09-May-98	231	2.5	3	39.3	49
PR25	46409	3	RV	07-May-98	270	2.3 J	-	47.7	69
PR24	46410	3	RV	07-May-98	88.3	2.2 J	-	42.9	20
PR23	46418	3	RV	09-May-98	254	1.4	2	37.6	51
PR16	46401	3	RV	05-May-98	404	1.4	3	28	61
PR14	46405	3	RV	06-May-98	285	1.6	2	30.7	47
Contribution to Prichard Creek from Side Stream Upstream of Sampling Location PR33									
PR37	46427	3	SS	10-May-98	3.13	1.1 J	-	46.7	1
PR34	46423	3	SS	10-May-98	3.96	0.93 J	-	3.4 J	-
PR35	46424	3	SS	10-May-98	70.1	0.57 J	-	7 J	-
Contribution to Prichard Creek From Side Streams Above Sampling Location PC29									
PR32	46415	3	SS	08-May-98	57.8	3.8	1	38	12
PR30	46413	3	SS	08-May-98	24.8	0.2 U	-	10 U	-
Contribution to Prichard Creek From Side Streams or Seeps above Sampling Location PC24									
PR43	46429	3	SS	11-May-98	16.7	0.6	0	48	4
PR44	46430	3	SS	11-May-98	3.91	0.2 U	-	46	1
Contribution to Prichard Creek From West Fork Eagle Creek									
PR22	46290	3	EFEC	08-May-98	13.7	94.6	7	371	27
PR21	46289	3	EFEC	08-May-98	21.4	29.5	3	389	45
PR49	46443	3	EFEC	19-May-98	16.2	14.8	1	343 J	-
PR48	46442	3	EFEC	19-May-98	19	15	2	349 J	-
PR20	46408	3	WFEC	06-May-98	26.9	0.5 U	-	5 U	-
PR19	46407	3	WFEC	06-May-98	29.7	0.5 U	-	5 U	-
PR17	46406	3	WFEC	06-May-98	178	0.5 U	-	5 U	-
PR18	46403	3	WFEC	05-May-98	217	2.9	3	53	62

Table 4.2-1 (Continued)
Mass Loading Prichard Creek

						Total Lead		Dissolved Zinc	
Location	Sample No.	Segment No.	Sample Type	Sample Date	Flow (CFS)	Conc. (µg/L)	Load (lbs/day)	Conc. (µg/L)	Load (lbs/day)
Contribution to Prichard Creek From Side Streams Upstream of Sampling Location PC43									
PR26	46411	3	SS	08-May-98	0.0422	0.2 U	-	10 U	-
PR28	46412	3	SS	08-May-98	0.0005	0.6	0	896	0
PR45	46431	3	SS	12-May-98	2.13	0.5 U	-	41.3	0
PR42	46428	3	SS	11-May-98	2.87	0.9	0	48	1
PR41	46417	3	SS	09-May-98	21.8	0.5 U	-	49.1	6
PR46	46432	3	SS	12-May-98	2.88	0.5 U	-	46.4	1
PR47	46433	3	SS	12-May-98	1.68	0.5 U	-	43.8	0
Additional Measurements at Mouth of Prichard Creek (sorted by increasing stream discharge)									
PR14	186812	3	RV	20-Oct-98	17	1	0	62	6
PR14	202103	3	RV	08-Sep-99	28	0.32	0	27	4
PR14	202102	3	RV	12-Aug-99	46	0.39	0	24	6
PR14	186813	3	RV	18-Nov-98	52	1	0	25	7
PR14	186814	3	RV	10-Dec-98	72	1	0	28	11
PR14	186815	3	RV	29-Dec-98	113	1	1	34	21
PR14	202101	3	RV	13-Jul-99	124	0.66	0	25	17
PR14	186816	3	RV	25-Feb-99	243	2	3	25	33
PR14	186819	3	RV	04-May-99	520	1	3	30	84
PR14	186821	3	RV	15-Jun-99	659	4	14	30	107
PR14	186817	3	RV	24-Mar-99	803	3	13	31	134
PR14	186818	3	RV	21-Apr-99	984	7	37	34	180
PR14	186820	3	RV	24-May-99	1170	25	158	26	164

Notes:
- : Data not available or mass load not calculated
CFS: Cubic feet per Second
EFEC: Tributary Creek Sample Location - Flows into East Fork Eagle Creek
WFEC: Tributary Creek Sample Location - Flows into West Fork Eagle Creek
lbs/day: pounds per day
µg/L: Micrograms per liter
RV: River Sample Location
SS: Side Stream Sample Location
U: Not detected
J: Estimated Value

5.0 FATE AND TRANSPORT

The fate and transport of metals in surface water, groundwater, and sediment in the Prichard Creek Watershed are discussed in this section. A conceptual model of fate and transport, important fate and transport mechanisms, and a summary of the probabilistic model developed to evaluate fate and transport, were presented in the fate and transport section in the Canyon Creek report and are not repeated here. This section draws upon that general information.

Initial findings on metals concentrations and mass loading for each segment, as presented above in Section 4, Nature and Extent, are briefly summarized in Section 5.1. Results of the probabilistic modeling are presented in Section 5.2. Sediment transport is summarized in Section 5.3. A summary of fate and transport of metals in Prichard Creek is presented in Section 5.4.

5.1 INTRODUCTION

Prichard Creek contributes minor quantities of cadmium, lead, zinc, and other metals to the North Fork. The lowest and highest dissolved cadmium and zinc and total lead loadings measured during three sampling events (May 1998, April 1999, and May 1999) are listed in Table 5.1-1. Potential sources of these metals in the watershed were identified for each segment in Section 4.1 and preliminary mass loading estimates were discussed in Section 4.2. Brief summaries of those results are included in this section.

Segment PrichCrkSeg01 contains the headwaters of Prichard Creek down to just above the Paragon mill site. The BLM identified five mining-related sites (source areas of potential metals contamination) in this segment; however, Prichard Creek does not receive significant metals input from this segment since the area is relatively undisturbed.

Segment PrichCrkSeg02 contains Bear Gulch, a tributary to Prichard Creek. The BLM identified nine source areas in this segment. Slightly elevated concentrations of dissolved lead have been observed in the lower part of Bear Gulch. The area is relatively undisturbed.

Segment PrichCrkSeg03 contains Prichard Creek, below the Paragon mill site, to its confluence with the North Fork. The BLM identified 44 source areas in this segment. Sampling of surface water indicates that metals concentrations in surface water are greater than ambient water quality criteria.

5.2 MODEL RESULTS

Results from the probabilistic model are discussed for cadmium, lead, and zinc in this section. Modeling results for estimates of discharge are discussed in Section 5.2.1. Modeling results for estimates of chemical concentrations and mass loading of cadmium, lead, and zinc are discussed in Section 5.2.2. Model results are summarized in Table 5.2-1. All modeling results are included in Appendix C.

Data were evaluated for one sampling location, PR14, located near the mouth of Prichard Creek and the town of Prichard. There was only one sampling location with 10 or more individual data points for each parameter of interest in Prichard Creek. This sampling location is shown on Figure 4.1-7. Sampling location PR14 lies within segment PrichCrkSeg03.

5.2.1 Estimated Discharge

An example of the lognormal distribution of discharge data at sampling location PR14 near Prichard is shown in Figure 5.2-1. This was the only location in Prichard Creek with sufficient data to conduct a probabilistic analysis.

In Figure 5.2-1, the discharge in cubic feet per second is plotted on a log scale versus the normal standard variate. The normal standard variate is equivalent to the standard deviation for a normalized variable. When the log of a variable (e.g., discharge) is plotted versus the standard normal variate, a straight line will result if the data are lognormally distributed. The cumulative distribution function gives the probability that the observed discharge at any given time will not be exceeded by the estimated discharge at that cumulative probability. The cumulative distribution function is plotted versus the normal standard variate in Figure 5.2-2. To determine the probability of occurrence of a specific discharge, first select the discharge of interest on Figure 5.2-1, then find its corresponding normal standard variate. Using that value for the normal standard variate, look up its corresponding cumulative probability in Figure 5.2-2. For example, for a discharge of 1,000 cfs, the normal standard variate is approximately 1.2 (Figure 5.2-1). Referring to Figure 5.2-2, this value corresponds to a cumulative probability of approximately 0.88; therefore, approximately 88 percent of the time, discharges at this location will be 1,000 cfs or less.

The probability distribution function (PDF) shown in Figure 5.2-1 is a predictive tool that can be used to estimate the expected discharge and provide a quantitative estimate of the probability that the observed discharge will not exceed a given value. Conversely, one can find the estimated discharge rate having a specified probability of exceedance or non-exceedance by the observed discharge.

As shown in Figure 5.2-1, there is a good fit of the lognormal regression line (solid line in Figure 5.2-1) to the data. This goodness of fit, as evidenced by a high coefficient of determination ($r^2 = 0.96$) (significant at a < 0.0001), supports the assumption that discharges are lognormally distributed. The dotted line represents the true (ideal) lognormal distribution having the same mean (365) and coefficient of variation (1.03) as the actual data. The estimated expected value of the discharge (534 cfs) is also indicated on the plot of the discharge data. Prichard Creek is a major contributor of flow to the North Fork.

5.2.2 Estimated Zinc, Lead, and Cadmium Concentrations and Mass Loading

Dissolved cadmium and zinc and total lead concentrations and loads were evaluated using the probabilistic model at the single sampling location that contained a minimum of ten data points, PR14.

To illustrate the lognormal distribution of dissolved zinc and total lead concentrations and dissolved zinc and total lead loads at sampling location PR14 on Prichard Creek, Figures 5.2-3 through 5.2-6 are provided. Dissolved cadmium concentrations were typically below the reporting limit of 0.5 µg/L. Consequently, dissolved cadmium concentrations and loads were not plotted; however, they were addressed probabilistically.

The high r-squared values (r^2) for the concentrations and loads when plotted lognormally attest to the fact that the data follow a lognormal distribution. For dissolved zinc concentrations, the r-squared value was 0.72. The r-squared value for the total lead concentration was 0.91. The corresponding values for dissolved zinc and total lead loads were 0.94 and 0.97, respectively.

To aid in interpreting and placing in context these results screening levels, expected values (EV), and total maximum daily loads (TMDLs) are shown on the figures where appropriate. The TMDLs are given at the 90th percentiles. The TMDLs used were those presented for the North Fork at Enaville in the Technical Support Document of August 2000 (USEPA 2000). Strictly speaking, TMDLs for non-point sources are for dissolved loads. The purpose of this exercise was to provide a reference value and point of discussion for lead because of the importance of the total lead load. Often, most of the lead will be in the particulate, as opposed to the dissolved, form. Because a high percentage of zinc load is in the dissolved form, zinc was compared to its dissolved TMDL loading capacity.

All except one of the measured and plotted total lead concentrations were less than the screening level (15 µg/L, Figure 5.2-3). The estimated expected total lead concentration (approximately 3.5 µg/L) was also less than the screening level (15 µg/L).

One of the observed dissolved zinc concentrations was greater than the screening level (Figure 5.2-4). The estimated dissolved zinc concentration (approximately 31 µg/L) is less than the screening level (42 µg/L).

The estimated total lead load at PR14 is approximately 43 pounds/day. The estimated expected value is greater than the 90th percentile TMDL value (16.3 pounds/day) for dissolved lead at Enaville (Figure 5.2-5).

As seen on Figure 5.2-6, none of the measured zinc loads exceeded the 90th percentile TMDL (886 pounds/day) for the dissolved zinc load at Enaville on the North Fork. The estimated value (approximately 84 pounds/day) fell between the 10th percentile (44.1 pounds/day) and 50th percentile (147 pounds/day) TMDLs at Enaville.

Figures 5.2-3 through 5.2-6 are examples of predictive tools that were developed to estimate and characterize dissolved zinc and total lead concentrations and loads with a specified probability or cumulative frequency. The form of the model is mathematically tractable in that concentrations and loads can be readily aggregated or disaggregated to the level of resolution desired and the estimates and their associated uncertainties can be tracked, propagated, and accumulated throughout the basin.

The results of these and additional analyses are presented in Appendix C. The calculations were performed in the same manner as described in the discharge section (Section 5.2.1).

5.2.3 Summary of Modeling Results for Sampling Location PR14

Prichard Creek was divided into three segments. Segment PrichCrkSeg01 is above the Paragon mill site and has few potential source areas and little indication of metal release. Segment PrichCrkSeg02, which is above Bear Gulch, also has few potential source areas; however, slightly elevated concentrations of dissolved lead have been measured in the lower portion of Bear Gulch. Segment PrichCrkSeg03 of Prichard Creek is below the Paragon mill site. This segment has numerous potential source areas. At times, concentrations of dissolved metals approach, or slightly exceed, the ambient water quality criteria at the downstream portion of this segment.

The estimated value of dissolved zinc (approximately 31.2 µg/L) was less than its screening level of 42 µg/L. Estimated total lead concentrations (approximately 3.5 µg/L) were less than the screening level of 15 µg/L. The estimated value of the dissolved zinc load (approximately 84 pounds/day) falls between the 10th and 50th percentile TMDLs established for the North Fork at Enaville. Total lead loads predicted by the probabilistic model (approximately 43 pounds/day) are greater than the 90th percentile TMDL for dissolved lead loads at Enaville.

Probabilistic modeling indicated that approximately 99 percent of the zinc concentration and 47 percent of the lead concentration would reside in the dissolved phase. Based on evaluation of data at PR14, estimated values of the total loadings at the mouth of Prichard Creek for zinc and lead are, approximately, 83.6 pounds/day and 43 pounds/day, respectively. Potential contributors to the dissolved and total metal concentrations and loads include the Paragon mining complex, Monarch adit, the Mother Lode Mine, and the Four Square Mine.

5.2.4 Concentrations Versus Discharge

There is a decrease in dissolved zinc concentrations with increased discharge (log-log plot of concentrations versus discharge which is significant at a < 0.22 (a is the probability the correlation is due to chance). Total lead concentrations increased with increasing discharge (a = 0.0003). The regressions permit estimation of dissolved and total zinc and lead concentrations and loads at various discharge rates (Appendix C).

5.3 SEDIMENT FATE AND TRANSPORT IN PRICHARD CREEK WATERSHED

Sediment fate and transport processes were presented in Section 3. Results of the sediment transport evaluation presented in Section 3 are summarized in this section.

The Prichard Creek Watershed has a drainage area of approximately 97.8 square miles with approximately 45 miles of mapped channel length. Sediment derived in Prichard Creek is transported to the North Fork. Sediment sources and transport processes were evaluated based on review and interpretation of aerial photographs. The review focused on morphologic features indicating stream instability, channel migration, channel aggregation or degradation and other features that may contribute sediment to the system. USGS sediment transport and stream discharge data are not available for Prichard Creek; therefore, estimates of sediment yield are not included in this discussion.

Likely sediment sources in the Prichard Creek Watershed include mining waste, channel bed remobilization and minor bank erosion. Sediment from the Prichard Creek Dredge Tailings in contact Prichard Creek, logging and drill exploration roads, and numerous small rock debris piles and dredge spoil piles in tributaries, are sources of sediment to Prichard Creek. Though suspended and bedload sediment samples were not collected and analyzed for metals, suspended and bedload sediment concentrations may be represented by metals concentrations reported for soil and sediment samples collected in the Prichard Creek. As presented in Section 4.1, Nature and Extent, metals concentrations in surface soil and sediment in segments PrichCrkSeg01 and PrichCrkSEg02 were generally low with low frequency of screening level exceedances. Metals concentrations in surface soils and sediment in segment PrichCrkSeg03 exceed screening levels for arsenic, cadmium, copper, iron, lead, manganese and zinc. The BLM identified 44 potential source areas in this segment.

5.4 SUMMARY OF FATE AND TRANSPORT IN PRICHARD CREEK

The probabilistic model was used to quantify and summarize the available data and to estimate pre-remediation metals concentrations in surface water and mass loading contributed to the North Fork by Prichard Creek.

Surface water discharge, metals concentrations (total and dissolved), and mass loading data were analyzed using lognormal PDFs at one sampling location in Prichard Creek. Only results for cadmium, lead and zinc were analyzed. Regressions were developed for total and dissolved concentrations versus discharge to quantify and identify trends in concentrations and mass loading with changing discharge rates. The percentages of dissolved and particulate forms of metals were computed from the estimated expected values predicted by the model.

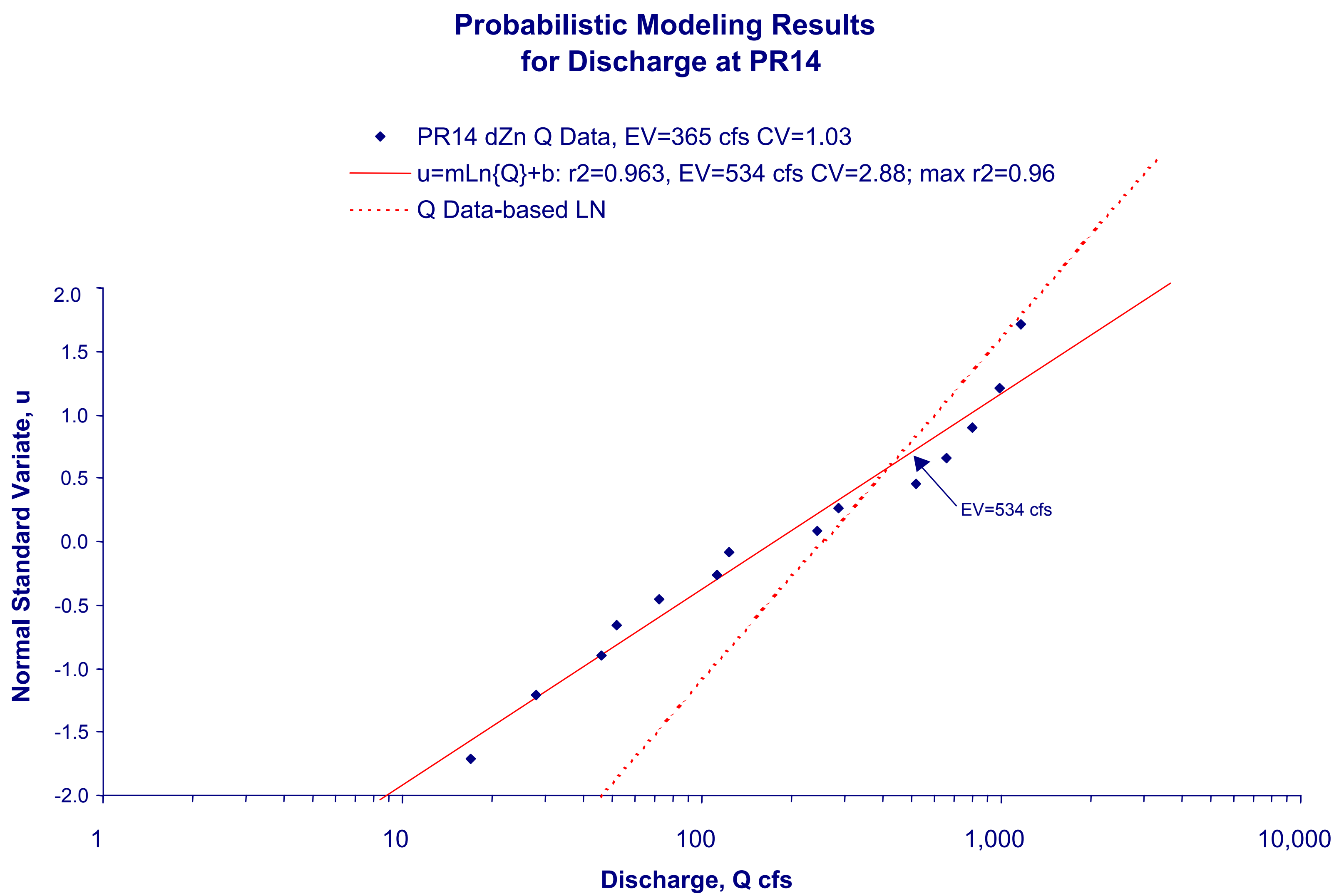
Results of the probabilistic modeling indicate:

- None of the modeled parameters exceeded screening levels.

- Probabilistic modeling indicated that approximately 99 percent of the zinc concentration and 47 percent of the lead concentration would reside in the dissolved phase.

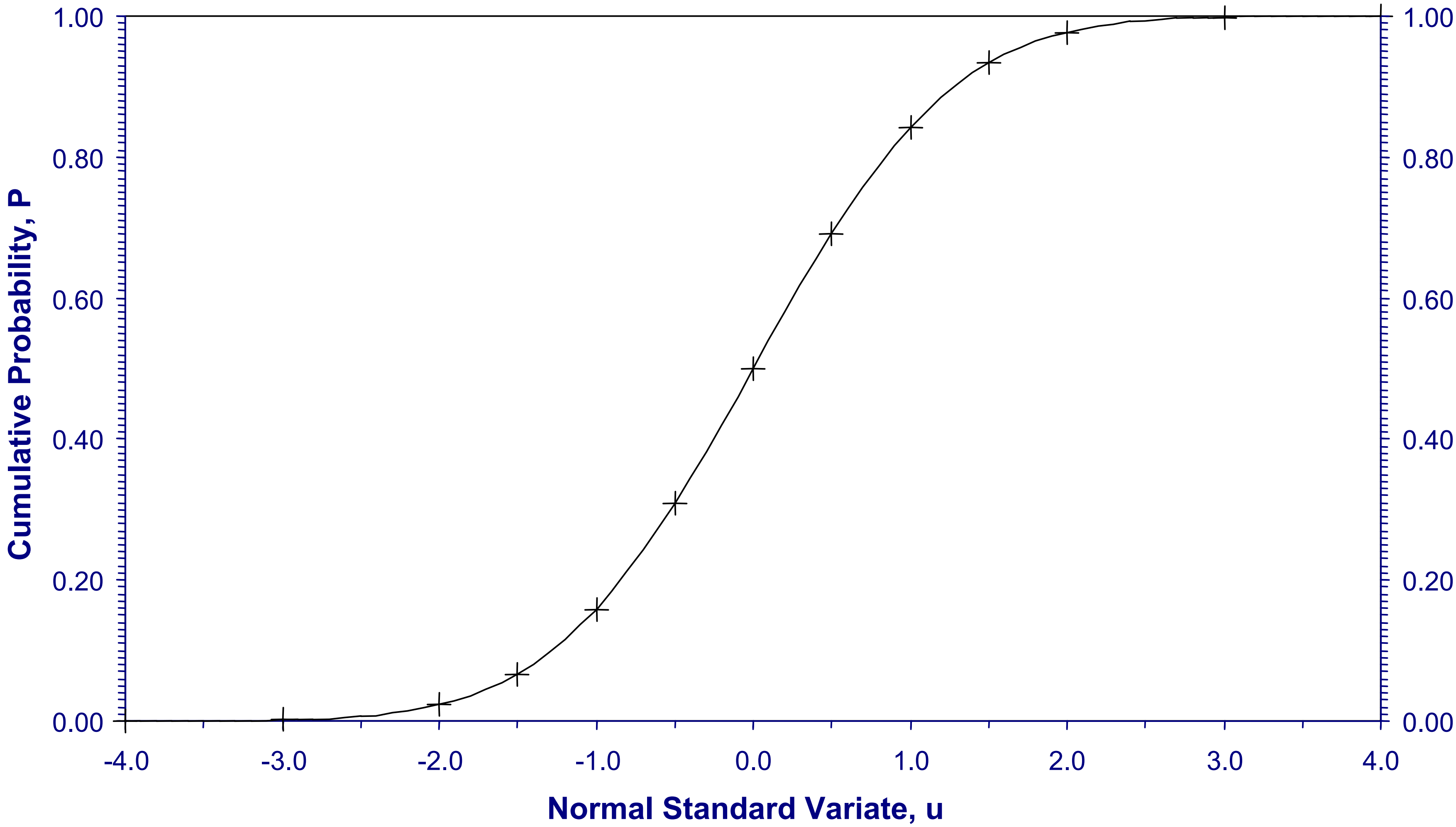
- Based on evaluation of data at PR14, estimated values of the total loadings at the mouth of Prichard Creek for zinc and lead are, approximately, 83.6 pounds/day and 43 pounds/day, respectively.

- Dissolved zinc concentrations decreased with increased discharge. Total lead concentrations increased with increased discharge rates.

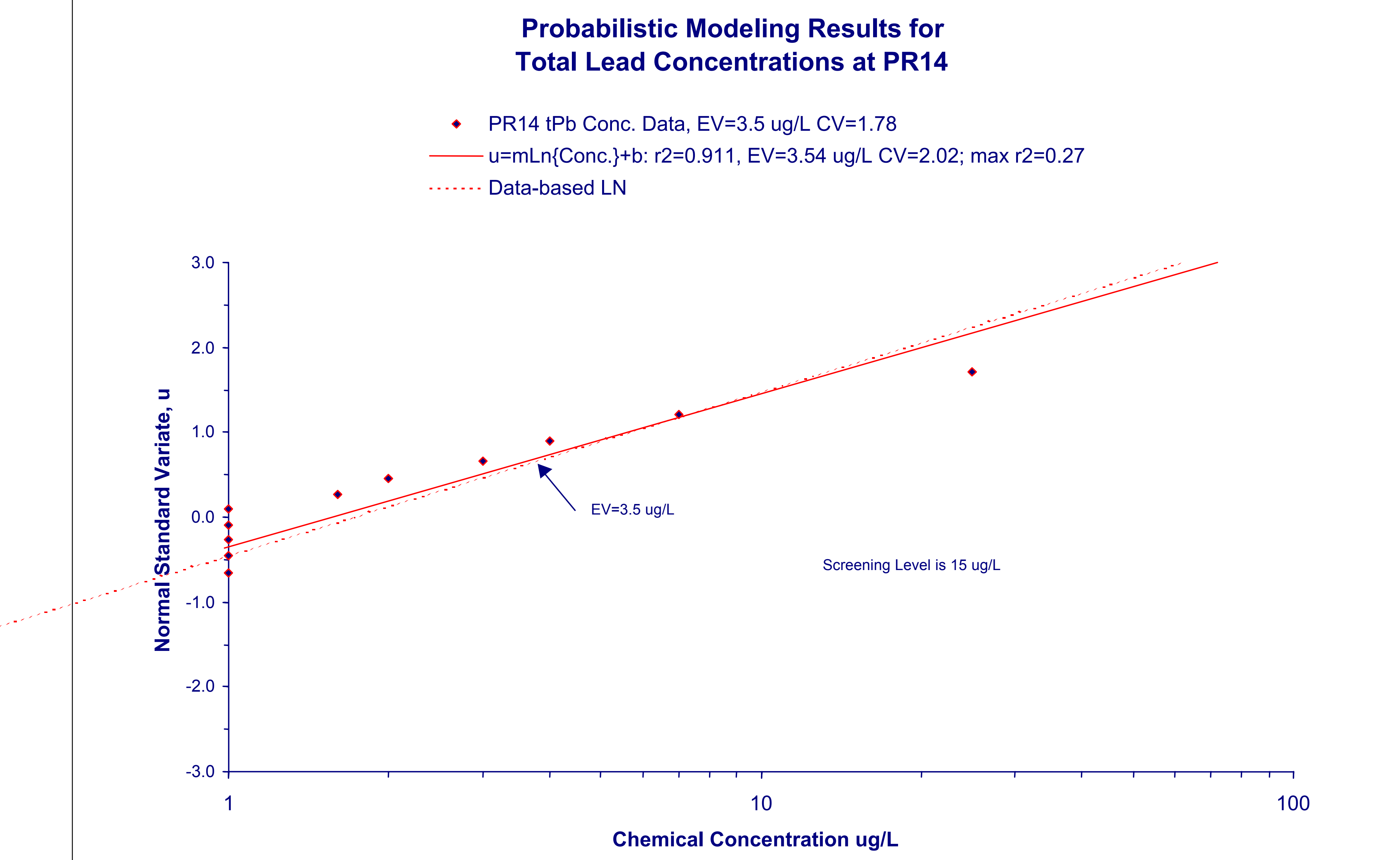


EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Prichard Creek Series 07/11/01	**Figure 5.2-1**

Cumulative Probability Values Corresponding to Normal Standard Variate Values



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Prichard Creek Series 07/11/01	Figure 5.2-2



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Prichard Creek Series
07/11/01

Figure 5.2-3

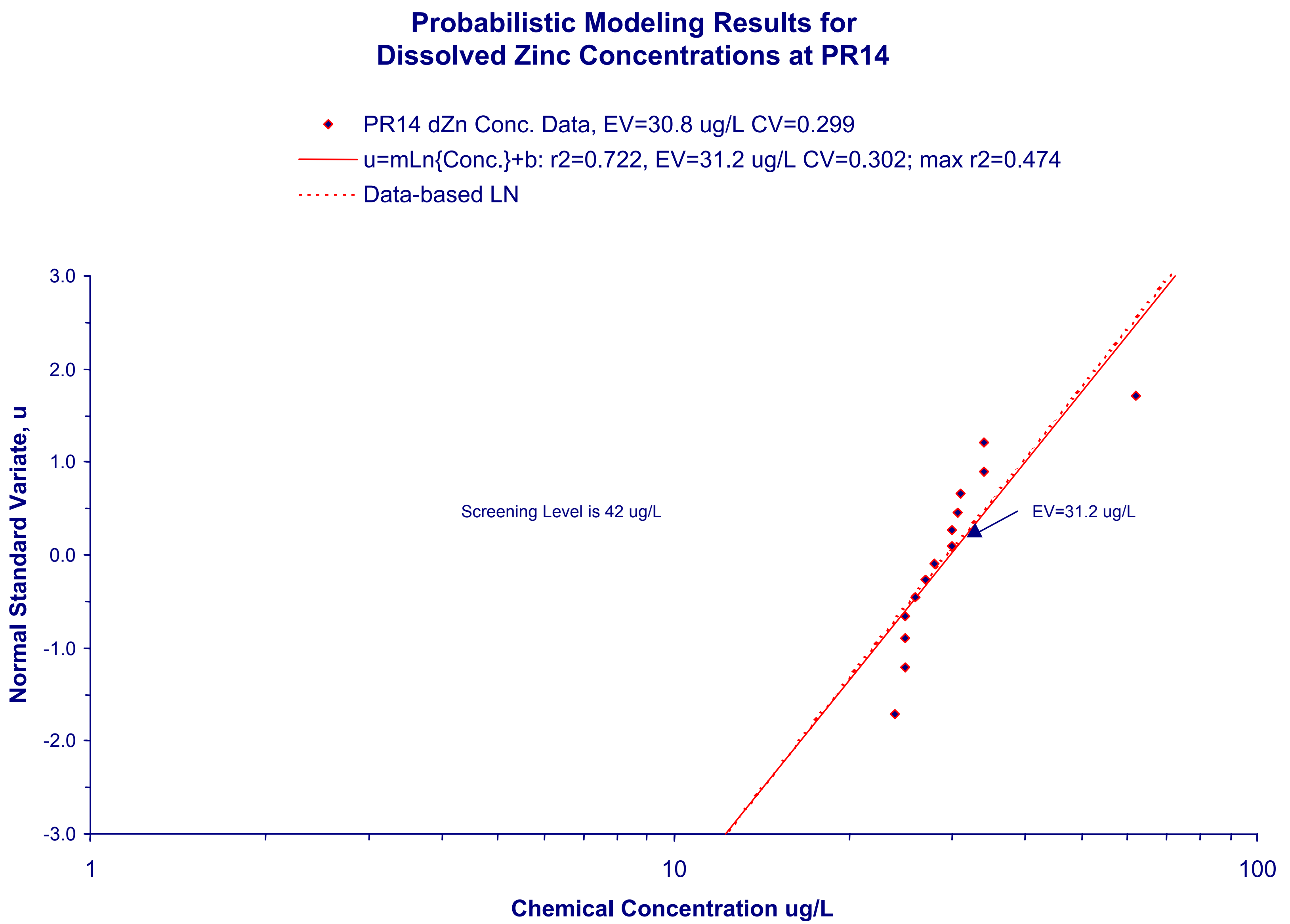
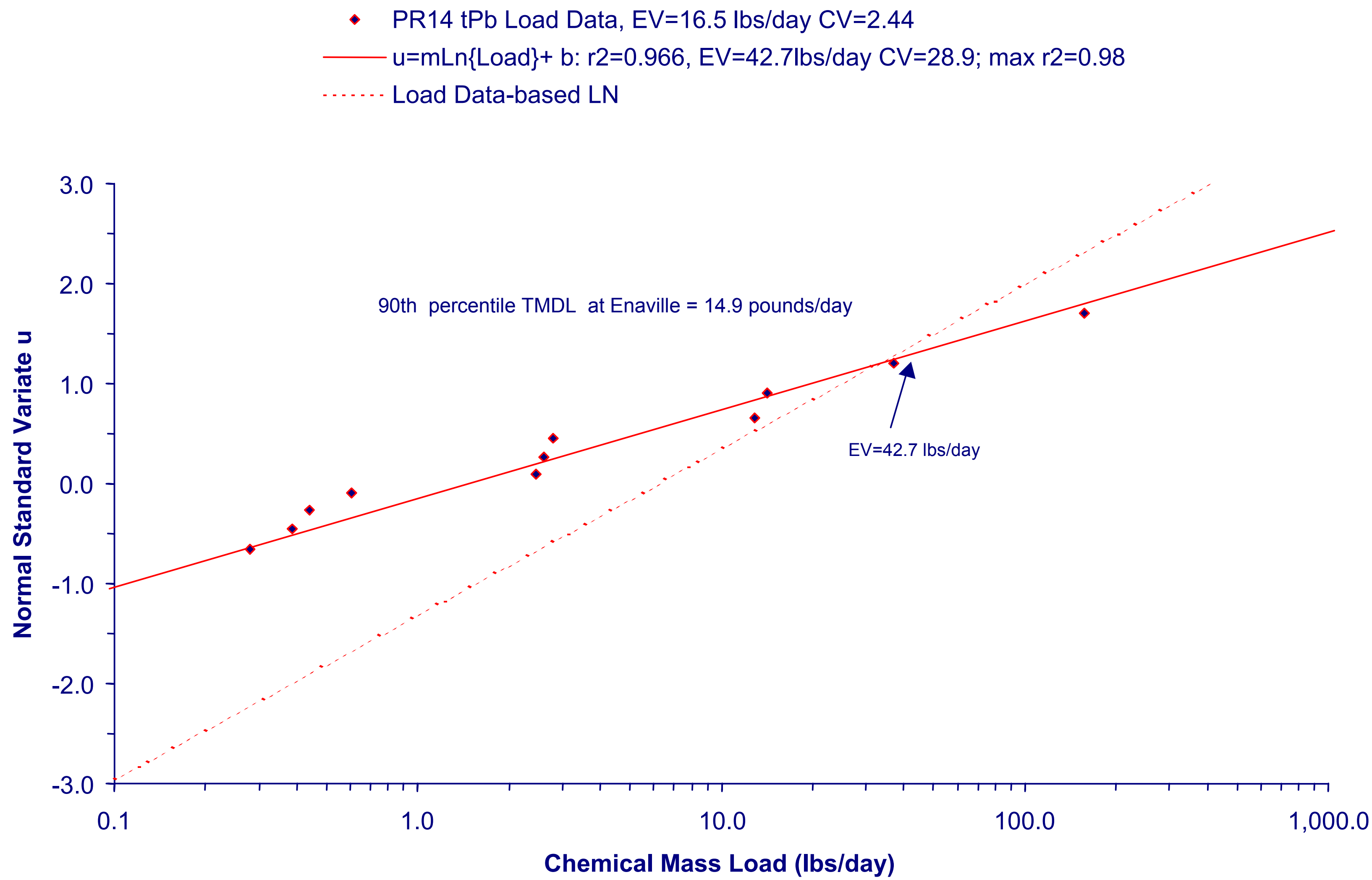
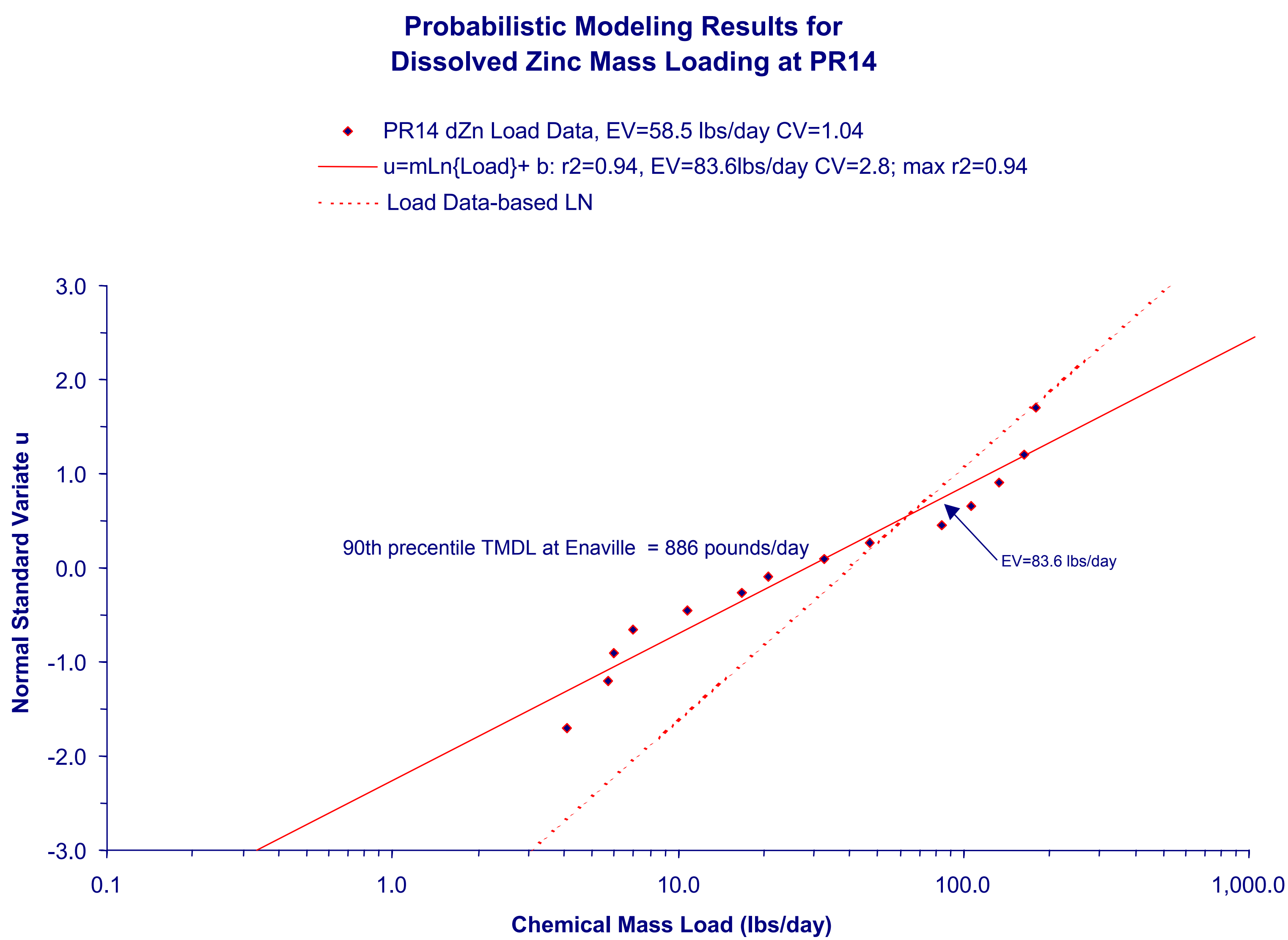

Probabilistic Modeling Results for
Dissolved Zinc Concentrations at PR14
PR14 dZn Conc. Data, EV=30.8 ug/L CV=0.299
u=mLn{Conc.}+b: r2=0.722, EV=31.2 ug/L CV=0.302; max r2=0.474
Data-based LN
Normal Standard Variate, u
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
Screening Level is 42 ug/L
EV=31.2 ug/L
1
10
100
Chemical Concentration ug/L

Figure 5.2-4

Probabilistic Modeling Results for Total Lead Mass Loading at PR14



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Prichard Creek Series 07/11/01	**Figure 5.2-5**



Probabilistic Modeling Results for
Dissolved Zinc Mass Loading at PR14
PR14 dZn Load Data, EV=58.5 lbs/day CV=1.04
u=mLn{Load}+ b: r2=0.94, EV=83.6lbs/day CV=2.8; max r2=0.94
Load Data-based LN
90th precentile TMDL at Enaville = 886 pounds/day
EV=83.6 lbs/day
Normal Standard Variate u
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
0.1
1.0
10.0
100.0
1,000.0
Chemical Mass Load (lbs/day)

Figure 5.2-6

Table 5.1-1
Low and High Instantaneous Metal Loading Values for Three Sampling Events (May 1998, April 1999, and May 1999)

Metal	Low (pounds/day)	High (pounds/day)
Dissolved Cadmium	0.184	0.87
Total Lead	0.4	158
Dissolved Lead	0.46	3.6
Dissolved Zinc	11.8	180

Table 5.2-1
Estimated Expected Values and Coefficients of Variation for Discharge, Concentrations, and Mass Loading at PR14

Estimated Parameter (Number of samples)	Estimated Expected Value (Coefficient of Variation)	Screening Level or TMDL[a]
Discharge in cfs		
Discharge (14)	534 (2.88)	Not applicable
Concentrations in µg/L		
Dissolved Cadmium (14)	0.42 (0.686)	0.38
Total Lead (14)	3.54 (2.02)	15
Dissolved Zinc(14)	31.2 (0.3)	42
Mass loading in pounds/day		
Dissolved Cadmium (14)	0.874 (2.34)	10.1
Total Lead (14)	42.7 (28.9)	16.3[b]
Dissolved Zinc(14)	83.6 (2.8)	886

[a]TMDLs are the 90th percentile values for the North Fork at Enaville (USEPA 2000).
[b]The total lead TMDL equals the dissolved lead TMDL x 1.1

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Section 5—Fate and Transport

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ATTACHMENT 1
Data Source References

Data Source References

Data Source References[a]	Data Source Name	Data Source Description	Reference
2	URS FSPA Nos. 1, 2, and 3	Fall 1997: Low Flow and Sediment Sampling	URS Greiner Inc. 1997. Field Sampling Plan Addendum 1 Sediment Coring in the Lower Coeur d'Alene River Basin, Including Lateral Lakes and River Floodplains
			URS Greiner Inc. 1997. Field Sampling Plan Addendum 2 Adit Drainage, Seep and Creek Surface Water Sampling
			URS Greiner Inc. 1997. Field Sampling Plan Addendum 3 Sediment Sampling Survey in the South Fork of the Coeur d'Alene River, Canyon Creek, and Nine-Mile Creek
3	URS FSPA No. 4	Spring 1998: High Flow Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 4 Adit Drainage, Seep and Creek Surface Water Sampling; Spring 1998 High Flow Event
4	MFG Historical Data Spring 1991	Spring 1991: High Flow Sampling	McCulley, Frick & Gillman, Inc. 1991. Upstream Surface Water Sampling Program Spring 1991 High Flow Event, South Fork Coeur d'Alene River Basin above Bunker Hill Superfund Site: Tables 1 and 2
5	MFG Historical Data Fall 1991	Fall 1991: Low Flow Sampling	McCulley, Frick & Gillman, Inc. 1992. Upstream Surface Water Sampling Program Fall 1991 Low Flow Event, South Fork Coeur d'Alene River Basin above Bunker Hill Superfund Site: Tables 1 and 2
6	EPA/Box Historical Data	Superfund Site Groundwater and	CH2MHill. 1997. Location of Wells and Surface Water Sites, Bunker Hill Superfund Site. Fax Transmission of Map August 11, 1998
			Environmental Protection Agency. 1998. E-mail from Ben Cope July 15, 1998. Subject: 2 Datasets File Attached: BOXDATA.WK4
7	IDEQ Historical Data	IDEQ Water Quality Data	Idaho Department of Environmental Quality. 1998. Assortment of files from Glen Pettit for water years 1993 through 1996
			Idaho Department of Environmental Quality. 1998. E-mail from Glen Pettit October 6, 1998 Subject: DEQ Water Quality Data Files Attached: 1998 trend Samples.xls, 1997 trend Samples.xls

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
8	EPA/NPDES Historical Data	Water Quality based on NPDES Program	Environmental Protection Agency. 1998. E-mail from Ben Cope August 11, 1998/September 2, 1998. Subject: Better PCS Data Files/Smelterville. Attached: PCS2.WK4, PCSREQ.698/TMT-PLAN.XLS
			Environmental Protection Agency. 1998. E-mail from Ben Cope August 5, 1998. Subject: State of Idaho Lat/Longs File Attached: PAT.DBF
			Environmental Protection Agency. 1998. E-mail from Ben Cope July 15, 1998. Subject: 2 Datasets File Attached: PCSDATA.WK4
10	URS FSPA No. 5	Common Use Areas Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 5 Common Use Areas: Upland Common Use Areas and Lower Basin Recreational Beaches; Sediment/Soil, Surface Water, and Drinking Water Supply Characterization
11	URS FSPA No. 8	Source Area Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 8 Tier 2 Source Area Characterization Field Sampling Plan
12	Historical Groundwater Data from MFG	1997 Annual Groundwater Data	McCulley, Frick & Gillman. 1998. 1997 Annual Groundwater Data Report Woodland Park
13	Historical Data from US Forest Service, Idaho Geological Survey and others	Historical Data on Inactive Mine Sites USFS, IGS and CCJM, 1994-1997, Prichard Creek, Pine Creek and Summit Mining District	Mackey K, Yarbrough, S.L. 1995. Draft Removal Preliminary Assessment Report Pine Creek Millsites, Coeur d'Alene District, Idaho, Contract No. 1422-N651-C4-3049
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. I, Prichard Creek and Eagle Creek Drainages
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. III, Coeur d'Alene River Drainage Surrounding the Coeur d'Alene Mining District (Excluding the Prichard Creek and Eagle Creek Drainages)
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. IV, Prichard Creek and Eagle Creek Drainages

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
13	Historical Data from US Forest Service, Idaho Geological Survey and others (continued)		Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. V, Coeur d'Alene River Drainage Surrounding the Coeur d'Alene Mining District (Excluding the Prichard Creek and Eagle Creek Drainages) Part 2 Secondary Properties
			US Forest Service. 1995. Pilot Inventory of Inactive and Abandoned Mine Lands, East Fork Pine Creek Watershed, Shoshone County, Idaho
14	Historical Sediment Core Data: University of Idaho (Thesis papers)	Historical Lateral Lakes Sediment Data from F. Rabbi and M.L. Hoffman	Characterization of Heavy Metal Contamination in Two Lateral Lakes of the Lower Coeur d'Alene River Valley, A thesis by M.L. Hoffmann, May 1995
			Trace Element Geochemistry of Bottom Sediments and Waters from the Lateral Lakes of Coeur d'Alene River, A Dissertation by F. Rabbi, May 1994
15	URS FSPA No. 9	Source Area Characterization; Field XRF Data	CH2M Hill and URS Greiner. 1998. Field Sampling Plan Addendum 9 Delineation of Contaminant Source Areas in the Coeur d'Alene Basin using Survey and Hyperspectral Imaging Techniques
16	Historical Sediment Data	Electronic Data compiled by USGS	U.S. Geological Survey. 1992. Effect of Mining-Related Activities on the Sediment-Trace Element Geochemistry of Lake Coeue d'Alene, Idaho, USA--Part 1: Surface Sediments, USGS Open-File Report 92-109, Prepared by A.J. Horowitz, K.A. Elrick, and R.B. Cook
			US Geological Survey. 2000. Chemical Analyses of Metal-Enriched Sediments, Coeur d'Alene Drainage Basin, Idaho: Sampling, Analytical Methods, and Results. Draft. October 13, 2000. Prepared by S.E. Box, A.A. Bookstrom, M. Ikramuddin, and J. Lindsey. Samples collected from 1993 to 1998.
17	USGS Spokane River Basin Sediment Samples	Surface Sediment Samples Collected by USGS in the Spokane River Basin	Environmental Protection Agency. 1999. Data Validation Memorandum and Attached Table from Laura Castrilli to Mary Jane Nearman dated June 9, 1999. Subject: Coeur d'Alene (Bunker Hill) Spokane River Basin Surface Sample Samples, USGS Metals Analysis, <63 um fraction, Data Validation, Samples SRH7-SRH30

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
18	USGS Snomelt Surface Water Data	Surface Water Data from 1999 Snomelt	USGS. 1999. USGS WY99.xls Spreadsheet dowloaded from USGS (Coeur d'Alene Office) ftp site
			USGS. 2000. Concentrations and Loads of Cadmium, Lead and Zinc Measured near the Peak of the 1999 Snomelt Runoff Hydrograph at 42 Stations, Coeur d'Alene River Basin Idaho
			USGS. 2000. Concentrations and Loads of Cadmium, Lead and Zinc Measured on the Ascending and Descending Limbs of the 1999 Snomelt Runoff Hydrograph at Nine Stations, Coeur d'Alene River Basin Idaho
22	MFG Report on Union Pacific Railroad Right-of-Way Soil Sampling	Surface and Subsurface Soil Lead Data	MFG. 1997. Union Pacific Railroad Wallace Branch, Rails to Trails Conversion, Right-of-Way Soil Sampling, Summary and Interpretation of Data. McCulley, Frick and Gilman, Inc. March 14, 1997
23	URS FSPA No. 11A	Source Area Groundwater and	URS Greiner Inc. 1999. Field Sampling Plan Addendum 11A Tier 2 Source Area Characterization
24	URS FSPA No. 15	Common Use Area Sampling—Spokane	URS Greiner Inc. 1999. Field Sampling Plan Addendum 15 Spokane River - Washington State Common Use Area Sediment Characterization
25	URS FSPA No. 18	Depositional and Common Use Area Sediment Sampling -	URS Greiner Inc. 2001. Final Field Sampling Plan Addendum No. 18, Fall 2000 Field Screening of Sediment in Spokane River Depositional Areas, Summary of Results. Revision 1. January 2001.

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
28	USGS National Water Quality Assessment database	Surface water data for sampling location NF50 at Enaville, Idaho.	USGS. 2001. USGS National Water Quality Assessment database: http://infotrek.er.usgs.gov/pls/nawqa/nawqa.wwv_main.gohome. Data retrieved on August 2, 2001 for station 12413000, NF Coeur d'Alene River at Enaville, Idaho.

[a]Reference Number is the sequential number used as cross reference to associate chemical results in data summary tables with specific data collection efforts

ATTACHMENT 2
Data Summary Tables

ABBREVIATIONS USED IN DATA SUMMARY TABLE

LOCATION TYPES:

AD adit
BH borehole
FP flood plain
GS ground surface/near surface
HA hand auger boring
LK lake/pond/open reservoir
OF outfall/discharge
RV river/stream
SP stockpile
TL tailings pile

QUALIFIERS:

U Analyte was not detected above the reported detection limit
J Estimated concentration

DATA SOURCE REFERENCES:

Data source references listed in Attachment 1 are shown in the Data Summary Tables in the "Ref" column.

Data Summary Table
Prichard Creek - segment PrichCrkSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Soil (mg/kg)														
PR8085	TL	13	---			**140**	**26**	86	40000	**860**	1200			**6500**
Surface Water - Total Metals (ug/l)														
PR8051	AD	13	---			2.9 U	**5**	**86**	68	8.7	6	0.5 U		**2200**
PR8079	RV	13	---			2.9 U	3 U	35 U	75	1.5 U	6	0.5 U		15
Surface Water - Dissolved Metals (ug/l)														
PR8051	AD	13	---			2.9 U	**14**	**9**	11	**4**	3	0.5 U		**2000**

Data Summary Table
Prichard Creek - segment PrichCrkSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X	Shaded Sample Results Exceed Screening Level By More Than 10X	Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Soil (mg/kg)														
PR8083	TL	13	---			85 U	**21**	86	**68000**	**6300**	490			**2700**
PR8091	TL	13	---			**160**	**250**	**850**	15000	* **40000**	680			* **53000**
Surface Water - Total Metals (ug/l)														
PR8002	RV	13	---			2.9 U	3 U	35 U	36	1.5 U	2 U	0.5 U		4
PR8052	AD	13	---			2.9 U	**4**	35 U	59	**15**	2	0.5 U		**420**
PR8053	AD	13	---			2.9 U	3 U	35 U	66	**58**	4	0.5 U		**230**
PR8080	RV	13	---			2.9 U	3 U	35 U	24	1.5 U	2 U	0.5 U		6
Surface Water - Dissolved Metals (ug/l)														
PR8052	AD	13	---			2.9 U	4 U	**12**	4 U	**6**	2 U	0.5 U		**470**
PR8053	AD	13	---			2.9 U	4 U	7 U	4 U	**36**	2 U	0.5 U		**210**

Data Summary Table
Prichard Creek - segment PrichCrkSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Soil (mg/kg)														
PR8082	TL	13	---			1300	14	760	91000	4200	580			1700
PR8084	TL	13	---			100	2.5	50	47000	170	410			100
PR8086	TL	13	---			85 U	2.5	53	43000	400	5100			46
PR8087	TL	13	---			* 2400	16	180	77000	8100	1000			3300
PR8088	TL	13	---			110	2.9	45	33000	120	590			140
PR8089	TL	13	---			160	230	660	30000	7100	1100			* 65000
PR8090	TL	13	---			100	160	300	28000	8400	1300			* 43000
PR8092	TL	13	---			2100	3.3	72	54000	2800	1800			290
PR8093	TL	13	---			170	330	250	28000	3000	1200			* 68000
Surface Water - Total Metals (ug/l)														
PR14	RV	18	10/20/1998				1 UJ			1				
PR14	RV	18	11/18/1998				1			1				20
PR14	RV	18	12/10/1998				1 UJ			1				
PR14	RV	18	12/29/1998				1 UJ			1				
PR14	RV	18	02/25/1999				1 UJ			2				40
PR14	RV	18	03/24/1999				1 UJ			3				40
PR14	RV	18	04/21/1999				1 UJ			7				40
PR14	RV	18	05/04/1999							1				30
PR14	RV	18	05/24/1999						690	25	29			40
PR14	RV	18	06/15/1999							4				30
PR14	RV	18	07/13/1999				0.13			0.66				25.4
PR14	RV	18	08/12/1999				0.12			0.39				22.8
PR14	RV	18	09/08/1999				0.13			0.32				24.1
PR14	RV	3	05/06/1998		0.5 U	1 U	0.15	3 U	20 U	1.6	5 U	0.2 U	0.3 U	30.6
PR16	RV	3	05/05/1998		0.2 U	2 U	0.2 U	2 U		1.4	5 U	0.2 U	0.2 U	29
PR16	RV	3	05/05/1998						43					
PR17	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
PR18	RV	3	05/05/1998		0.2 U	2 U	0.3	2 U	38	2.9	5 U	0.2 U	0.2 U	50
PR19	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
PR20	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
PR21	RV	3	05/08/1998		0.4	2 U	1.9	3	24	29.5	5 U	0.2 U	0.2 U	364
PR22	RV	3	05/08/1998		0.4	2 U	2.1	2	20 U	94.6	5 U	0.5 U	0.2 U	370
PR23	RV	3	05/09/1998		0.5 U	1 U	0.16	3 U	38.6	1.4	5 U	0.2 UJ	0.3 U	37.9
PR24	RV	3	05/07/1998		0.032 U	0.4 J	0.094 J	0.44 U	14.8 J	2.2 J	1.3 J	0.16 U	0.042 U	36.9
PR25	RV	3	05/07/1998		0.032 U	0.26 J	0.096 J	0.44 U	15.5 J	2.3 J	1.2 J	0.16 U	0.042 U	45.6

Data Summary Table
Prichard Creek - segment PrichCrkSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
PR26	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.5 U	0.2 U	10 U
PR27	RV	3	05/09/1998		0.5 U	1 U	0.18	3 U	25.9	2.5	5 U	0.2 UJ	0.3 U	**39.6**
PR28	RV	3	05/08/1998		0.2 U	2 U	**3.4**	2 U	20 U	0.6	5 U	0.5 U	0.2 U	**858**
PR29	RV	3	05/09/1998		0.5 U	1 U	0.19	3 U	126	2.3	18.6	0.2 UJ	0.3 U	**48.5**
PR30	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.5 U	0.2 U	10 U
PR31	RV	3	05/10/1998			0.3 J	0.2 U	0.5 J	14.7 J	2.7 J	1 J	0.2 U		**45.1**
PR32	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	3.8	5 U	0.2 U	0.2 U	**36**
PR33	RV	3	05/10/1998			0.2 U	0.2 U	0.4 U	24.7 J	3.6	1.6 J	0.2 U	0.4 U	**47.4**
PR34	RV	3	05/10/1998		0.032 U	0.23 U	0.042 U	0.51 J	13.5 J	0.93 J	0.79 J	0.16 U	0.042 U	3.5 J
PR35	RV	3	05/10/1998		0.032 U	0.46 J	0.042 U	0.4 U	18.2 J	0.57 J	0.97 J	0.16 U	0.042 U	6.8 J
PR36	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	32	0.8	5 U	0.2 U	0.2 U	24
PR37	RV	3	05/10/1998		0.032 U	0.31 J	0.14 J	0.44 U	6.8 J	1.1 J	0.21 J	0.16 U	0.042 U	**38.3**
PR38	RV	3	05/10/1998		0.032 U	0.23 U	0.042 U	0.44 U				0.16 U	0.042 U	
PR38	RV	3	05/10/1998						20.2 J	0.25 J	2 J			4.1 J
PR41	RV	3	05/09/1998		0.5 U	1 U	0.2	3 U	20 U	0.5 U	5 U	0.2 UJ	0.3 U	**48.8**
PR42	RV	3	05/11/1998		0.2 U	2 U	0.3	2 U	28	0.9	5 U	0.2 U	0.2 U	**48**
PR43	RV	3	05/11/1998		0.2 U	2 U	0.2 U	2 U	24	0.6	5 U	0.2 U	0.2 U	**49**
PR44	RV	3	05/11/1998		0.2 U	2 U	0.2	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	**48**
PR45	RV	3	05/12/1998		0.5 U	1 U	0.17	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	**42.3**
PR48	RV	3	05/19/1998		0.38 U	0.23 U	1.6 J	0.93 J	19.5 J	15	0.47 J	0.16 U	0.042 U	**345**
PR49	RV	3	05/19/1998		0.38 U	0.23 U	1.5 J	**1.6 J**	19.9 J	14.8	0.54 J	0.16 U	0.042 U	**350**
PR8000	RV	13	---			2.9 U	3 U	35 U	**320**	1.5 U	13	0.5 U		26
PR8001	RV	13	---			2.9 U	3 U	35 U	86	2.6	7	0.5 U		**31**
PR8003	RV	13	---			2.9 U	3 U	35 U	49	1.5 U	3	0.5 U		3 U
PR8004	RV	13	---			2.9 U	3 U	35 U	37	1.5 U	2 U	0.5 U		5
PR8005	RV	13	---			2.9 U	3 U	35 U	58	1.5 U	2	0.5 U		5
PR8006	RV	13	---			2.9 U	3 U	35 U	75	6.9	4	0.5 U		**250**
PR8007	RV	13	---			2.9 U	**4**	35 U	46	1.5 U	3	0.5 U		**51**
PR8008	RV	13	---			2.9 U	3 U	35 U	**400**	1.5 U	2	0.5 U		3 U
PR8009	RV	13	---			2.9 U	3 U	35 U	27	1.5 U	2	0.5 U		3 U
PR8010	RV	13	---			2.9 U	3 U	35 U	46	1.5 U	26	0.5 U		3 U
PR8011	RV	13	---			2.9 U	**6**	35 U	40	1.5 U	2 U	0.5 U		**31**
PR8013	RV	13	---			2.9 U	3 U	35 U	53	1.5 U	2 U	1		21
PR8015	AD	13	---			2.9 U	3 U	35 U	61	3		0.5 U		
PR8015	AD	13	---								7			29
PR8016	AD	13	---			2.9 U	3 U	35 U	64		8	0.5 U		16
PR8016	AD	13	---							1.5 U				

Data Summary Table
Prichard Creek - segment PrichCrkSeg03

Legend
Boxed Sample Results Exceed Screening Level By More Than 1X
Shaded Sample Results Exceed Screening Level By More Than 10X
Shaded Results With (*) Exceed Screening Level By More Than 100X

Surface Water - Total Metals (ug/l)

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
PR8017	AD	13	---			2.9 U						0.5 U		
PR8017	AD	13	---				**7**	*** 770**	170	2	10			10
PR8018	RV	13	---			2.9 U	3 U	35 U	**610**		7	0.5 U		24
PR8018	RV	13	---							1.5 U				
PR8019	AD	13	---			2.9 U	**3**	35 U	12 U		3	0.63		8
PR8019	AD	13	---							1.5 U				
PR8020	AD	13	---			4.1	**4**	35 U	**1900**		**500**	0.5 U		14
PR8020	AD	13	---							1.5 U				
PR8021	AD	13	---			2.9 U	**5**	35 U	**690**	5	**86**	0.5 U		15
PR8022	AD	13	---			2.9 U	**3**	35 U	27		2 U	0.5 U		3 U
PR8022	AD	13	---							1.5 U				
PR8024	RV	13	---			2.9 U	3 U	35 U	89		4	0.5 U		15
PR8024	RV	13	---							2.3				
PR8025	RV	13	---			2.9 U	3 U	35 U	99		7	0.5 U		17
PR8025	RV	13	---							1.5 U				
PR8026	AD	13	---			2.9 U	3 U	35 U	43		3	0.5 U		3 U
PR8026	AD	13	---							1.5 U				
PR8027	AD	13	---			2.9 U	**4**	35 U	12 U		4	0.5 U		8
PR8027	AD	13	---							1.5 U				
PR8029	RV	13	---			2.9 U	3 U	35 U	32	2 U	2 U	0.5 U		3 U
PR8030	AD	13	---			2.9 U	**6**	35 U	51		18	0.5 U		14
PR8030	AD	13	---							1.5 U				
PR8034	RV	13	---			2.9 U	3 U	35 U	49	1.5 U	3	0.5 U		3 U
PR8035	RV	13	---			2.9 U	3 U	35 U	37	1.5 U	2 U	0.5 U		5
PR8045	AD	13	---			2.9 U	**12**	35 U	22	**33**	15	0.5 U		**2800**
PR8046	AD	13	---			2.9 U	3 U	35 U	43	**100**	7	0.5 U		**570**
PR8047	SP	13	---			2.9 U	**8**	35 U	110	9	20	0.5 U		**2100**
PR8050	SP	13	---			2.9 U	3 U	35 U	**1800**	4.3	**200**	0.5 U		**390**
PR8054	AD	13	---			**110**	**6**	**62**	190	**190**	**130**	0.5 U		**470**
PR8055	AD	13	---			2.9 U	3 U	35 U	56	3	2 U	0.5 U		7
PR8056	AD	13	---			2.9 U	3 U	35 U	210	1.5 U	40	0.5 U		**110**
PR8059	RV	13	---			2.9 U	**7**	35 U	100	1.5 U	5	0.32		**33**
PR8060	AD	13	---			3.1	**11**	35 U	12 U	**18**	6	0.35		**920**
PR8061	RV	13	---			2.9 U	**13**	35 U	12 U	**74**	4	0.5 U		**1500**
PR8064	AD	13	---			2.9 U	**12**	35 U	12 U	1.9	14	0.5 U		**1400**
PR8070	SP	13	---			2.9 U	**3**	35 U	**3400**	4	**570**	0.5		**490**
PR8071	RV	13	---			2.9 U	3 U	35 U	130	1.5 U	7	0.5 U		20

Data Summary Table
Prichard Creek - segment PrichCrkSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
PR8073	AD	13	---			2.9 U	**3**	35 U	290	5	22	0.67		17
PR8074	AD	13	---			3.6	3 U	35 U	220	4	10	0.77		6
PR8075	AD	13	---			2.9 U	3 U	35 U	**770**	1.5 U	6	0.5 U		3 U
PR8078	SP	13	---			2.9 U	3 U	35 U	**370**	**28**	15	0.5 U		**90**
Surface Water - Dissolved Metals (ug/l)														
PR14	RV	18	10/20/1998				1 UJ			1 UJ				**62**
PR14	RV	18	11/18/1998				1 UJ							25
PR14	RV	18	12/10/1998				1 UJ			1 UJ				28
PR14	RV	18	12/29/1998				1 UJ			1 UJ				34
PR14	RV	18	02/25/1999				1 UJ			1				25
PR14	RV	18	03/24/1999				1 UJ			1				31
PR14	RV	18	04/21/1999				1 UJ			1				34
PR14	RV	18	05/04/1999				1 U			1 U				30
PR14	RV	18	05/24/1999				1 U		6	1 U	1.8			26
PR14	RV	18	06/15/1999				**1**			1				30
PR14	RV	18	07/13/1999				1 U			1 U				25
PR14	RV	18	08/12/1999				1 U			1 U				24
PR14	RV	18	09/08/1999				1 U			1 U				27
PR14	RV	3	05/06/1998		0.5 U	1 U	0.12	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	30.7
PR16	RV	3	05/05/1998		0.2 U	2 U	0.2	2 U	20 U	0.6	5 U	0.2 U	0.2 U	28
PR17	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
PR18	RV	3	05/05/1998		0.2 U	2 U	0.3	2 U	20 U	**1.4**	5 U	0.2 U	0.2 U	**53**
PR19	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	48.7 U	0.5 U	5 U	0.2 U	0.3 U	5 U
PR20	RV	3	05/06/1998		0.5 U	1 U	0.1 U	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	5 U
PR21	RV	3	05/08/1998		0.4	2 U	**1.8**	2 U	20 U	**18**	5 U	0.2 U	0.2 U	**389**
PR22	RV	3	05/08/1998		0.4	2 U	**2**	2 U	20 U	**72.1**	5 U	0.2 U	0.2 U	**371**
PR23	RV	3	05/09/1998		0.5 U	1 U	0.16	3 U	20 U	0.5 U	5 U	0.2 UJ	0.3 U	37.6
PR24	RV	3	05/07/1998		0.032 U	0.26 J	0.12 J	0.44 U	5.6 U	0.82 J	0.23 J	0.16 U	0.042 U	**42.9**
PR25	RV	3	05/07/1998		0.032 U	0.23 U	0.16 J	0.92 J	5.6 U	**1.2 J**	0.37 J	0.16 U	0.042 U	**47.7**
PR26	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	1	5 U	0.2 U	0.2 U	10 U
PR27	RV	3	05/09/1998		0.5 U	1 U	0.16	3 U	20 U	**2.1**	5 U	0.2 UJ	0.3 U	39.3
PR28	RV	3	05/08/1998		0.2 U	2 U	**3.4**	2 U	20 U	0.3	5 U	0.2 U	0.2 U	**896**
PR29	RV	3	05/09/1998		0.5 U	1 U	0.17	3 U	20 U	**1.1**	5 U	0.2 UJ	0.3 U	**47.5**
PR30	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	10 U
PR31	RV	3	05/10/1998			0.2 U	0.3 UJ	0.4 U	6.9 J	**1.9 J**	0.9 J	0.2 U		**75.6**
PR32	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	**2.3**	5 U	0.2 U	0.2 U	38

Data Summary Table
Prichard Creek - segment PrichCrkSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
PR33	RV	3	05/10/1998			0.2 U	0.2 UJ	0.4 U	12.7 J	**1.8 J**	0.4 U	0.2 U		**52.3**
PR34	RV	3	05/10/1998		0.032 U	0.23 U	0.063 J	0.45 J	5.6 U	0.37 J	0.47 J	0.16 U	0.042 U	3.4 J
PR35	RV	3	05/10/1998		0.032 U	0.29 J	0.042 U	0.44 U	6.1 J	0.12 J	0.18 J	0.16 U	0.042 U	7 J
PR36	RV	3	05/08/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.9	5 U	0.2 U	0.2 U	25
PR37	RV	3	05/10/1998		0.032 U	0.27 J	0.2 J	0.4 U	5.6 U	0.72 J	0.034 U	0.16 U	0.042 U	**46.7**
PR38	RV	3	05/10/1998		0.032 U	0.24 J	0.042 U	0.44 U	5.6 U	0.11 U	0.2 J	0.16 U	0.042 U	4 J
PR41	RV	3	05/09/1998		0.5 U	1 U	0.2	3 U	20 U	0.5 U	5 U	0.2 UJ	0.3 U	**49.1**
PR42	RV	3	05/11/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	**48**
PR43	RV	3	05/11/1998		0.2 U	2 U	0.2 U	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	**48**
PR44	RV	3	05/11/1998		0.2 U	2 U	0.2	2 U	20 U	0.2 U	5 U	0.2 U	0.2 U	**46**
PR45	RV	3	05/12/1998		0.5 U	1 U	0.16	3 U	20 U	0.5 U	5 U	0.2 U	0.3 U	41.3
PR48	RV	3	05/19/1998		0.41 U	0.23 U	**1.5 J**	0.94 J	13.1 J	**13**	0.31 J	0.16 U	0.042 UJ	**349 J**
PR49	RV	3	05/19/1998		0.4 U	0.23 U	**1.6 J**	1.2 J	15.5 J	**12**	0.94 J	0.16 U	0.042 UJ	**343 J**
PR8000	RV	13	---			2.9 U	4 U	**12**	6	**2**	2 U	0.5 U		8 U
PR8001	RV	13	---			2.9 U	4 U	7 U	9	1.5 U	2 U	0.5 U		8 U
PR8015	AD	13	---				4 U		4 U		2 U	0.5 U		8 U
PR8015	AD	13	---					**24**						
PR8015	AD	13	---			2.9 U				1.5 U				
PR8016	AD	13	---				4 U	**13**	14		5	0.5 U		8 U
PR8016	AD	13	---			2.9 U				1.5 U				
PR8017	AD	13	---				4 U	**10**				0.5 U		
PR8017	AD	13	---						10		2			15
PR8017	AD	13	---			2.9 U				1.5 U				
PR8018	RV	13	---				4 U	**10**	4 U		2 U	0.5 U		8 U
PR8018	RV	13	---			2.9 U				1.5 U				
PR8019	AD	13	---				**5**	7 U	7		2 U			8 U
PR8020	AD	13	---				**5**	7 U	**1800**		**490**			**50**
PR8021	AD	13	---				4 U	7 U	32		**71**			20
PR8021	AD	13	---							1.5 U				
PR8022	AD	13	---				4 U	**7**	7		2 U			15
PR8024	RV	13	---				4 U	**21**	19		2 U	0.5 U		8 U
PR8024	RV	13	---			2.9 U				1.5 U				
PR8025	RV	13	---				4 U	**22**	7		2 U	0.5 U		8 U
PR8025	RV	13	---			2.9 U				1.5 U				
PR8026	AD	13	---				**9**	**23**	6		2 U			8 U
PR8027	AD	13	---				**5**	7 U	10		2 U			**110**
PR8045	AD	13	---			2.9 U	**15**	**19**	4 U	**22**	8	0.5 U		**2600**

Data Summary Table
Prichard Creek - segment PrichCrkSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
PR8046	AD	13	---			2.9 U	**7**	**15**	4 U	**89**	2 U	0.5 U		**570**
PR8047	SP	13	---			2.9 U	**13**	**20**	6	**48**	13	0.5 U		**2200**
PR8050	SP	13	---			2.9 U	4 U	**11**	4.4 U	1.5 U	**170**	0.5 U		**280**
PR8054	AD	13	---			86	4 U	**44**	4 U	**41**	**110**	0.5 U		**470**
PR8055	AD	13	---			2.9 U	4 U	**15**	4 U	1.5 U	2 U	0.5 U		8 U
PR8056	AD	13	---			2.9 U	4 U	**16**	4 U	1.5 U	8	0.5 U		**79**
PR8059	RV	13	---				**6**	**16**	15		2 U			14
PR8060	AD	13	---				**11**	**17**	4 U	**16**	2 U			**780**
PR8061	RV	13	---				**15**	**17**	4 U	**63**	2 U			**1300**
PR8064	AD	13	---				**11**	7 U	10		12			**1300**
PR8070	SP	13	---			2.9 U	4 U	**27**	10	1.5 U	2	0.5 U		23
PR8071	RV	13	---			2.9 U	4 U	7 U	9	1.5 U	2	0.5 U		8 U
PR8073	AD	13	---				**6**	**16**	4 U	1.5 U	2 U			8 U
PR8074	AD	13	---				**8**	**12**	4 U	1.5 U	2 U			8 U
PR8075	AD	13	---				**6**	**16**	5		2 U			8 U

ATTACHMENT 3
Statistical Summary Tables for Metals

Statistical Summary of Total Metals Concentrations in Surface Soil
Segment PrichCrkSeg01
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Arsenic	1	1	140	140	140	< 0.001	22	1	0	0
Cadmium	1	1	26	26	26	< 0.001	9.8	1	0	0
Copper	1	1	86	86	86	< 0.001	100	0	0	0
Iron	1	1	40,000	40,000	40,000	< 0.001	65,000	0	0	0
Lead	1	1	860	860	860	< 0.001	171	1	0	0
Manganese	1	1	1,200	1,200	1,200	< 0.001	3,597	0	0	0
Zinc	1	1	6,500	6,500	6,500	< 0.001	280	1	1	0

Statistical Summary of Total Metals Concentrations in Surface Water
Segment PrichCrkSeg01
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Cadmium	2	1	5	5	5	< 0.001	2	1	0	0
Copper	2	1	86	86	86	< 0.001	1	1	1	0
Iron	2	2	68	75	71.5	0.07	300	0	0	0
Lead	2	1	8.7	8.7	8.7	< 0.001	15	0	0	0
Manganese	2	2	6	6	6	< 0.001	50	0	0	0
Zinc	2	2	15	2,200	1,110	1.4	30	1	1	0

Statistical Summary of Dissolved Metals Concentrations in Surface Water
Segment PrichCrkSeg01
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Cadmium	1	1	14	14	14	< 0.001	0.38	1	1	0
Copper	1	1	9	9	9	< 0.001	3.2	1	0	0
Iron	1	1	11	11	11	< 0.001	1,000	0	0	0
Lead	1	1	4	4	4	< 0.001	1.09	1	0	0
Manganese	1	1	3	3	3	< 0.001	20.4	0	0	0
Zinc	1	1	2,000	2,000	2,000	< 0.001	42	1	1	0

Statistical Summary of Total Metals Concentrations in Surface Soil
Segment PrichCrkSeg02
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Arsenic	2	1	160	160	160	< 0.001	22	1	0	0
Cadmium	2	2	21	250	136	1.19	9.8	2	1	0
Copper	2	2	86	850	468	1.15	100	1	0	0
Iron	2	2	15,000	68,000	41,500	0.9	65,000	1	0	0
Lead	2	2	6,300	40,000	23,200	1.03	171	2	2	1
Manganese	2	2	490	680	585	0.23	3,597	0	0	0
Zinc	2	2	2,700	53,000	27,900	1.28	280	2	1	1

Statistical Summary of Total Metals Concentrations in Surface Water
Segment PrichCrkSeg02
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Cadmium	4	1	4	4	4	< 0.001	2	1	0	0
Iron	4	4	24	66	46.3	0.42	300	0	0	0
Lead	4	2	15	58	36.5	0.83	15	1	0	0
Manganese	4	2	2	4	3	0.47	50	0	0	0
Zinc	4	4	4	420	165	1.21	30	2	1	0

Statistical Summary of Dissolved Metals Concentrations in Surface Water
Segment PrichCrkSeg02
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Copper	2	1	12	12	12	< 0.001	3.2	1	0	0
Lead	2	2	6	36	21	1.01	1.09	2	1	0
Zinc	2	2	210	470	340	0.54	42	2	1	0

Statistical Summary of Total Metals Concentrations in Surface Soil
Segment PrichCrkSeg03
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Arsenic	9	8	100	2,400	805	1.22	22	8	3	1
Cadmium	9	9	2.5	330	84.6	1.47	9.8	5	3	0
Copper	9	9	45	760	263	1.03	100	5	0	0
Iron	9	9	28,000	91,000	47,900	0.47	65,000	2	0	0
Lead	9	9	120	8,400	3,810	0.88	171	7	6	0
Manganese	9	9	410	5,100	1,450	0.99	3,597	1	0	0
Zinc	9	9	46	68,000	20,200	1.47	280	6	4	3

Statistical Summary of Total Metals Concentrations in Surface Water
Segment PrichCrkSeg03
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	31	2	0.4	0.4	0.4	< 0.001	6	0	0	0
Arsenic	79	9	0.26	110	13.6	2.66	50	1	0	0
Cadmium	89	41	0.094	13	3.21	1.17	2	20	0	0
Copper	79	8	0.5	770	105	2.57	1	5	2	1
Iron	80	63	6.8	3,400	226	2.38	300	10	1	0
Lead	92	56	0.25	190	13.1	2.43	15	9	1	0
Manganese	80	51	0.21	570	36.4	2.97	50	5	1	0
Mercury	79	7	0.32	1	0.606	0.4	2	0	0	0
Zinc	89	75	3.5	2,800	200	2.37	30	44	14	0

Statistical Summary of Dissolved Metals Concentrations in Surface Water
Segment PrichCrkSeg03
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	31	2	0.4	0.4	0.4	< 0.001	2.92	0	0	0
Arsenic	51	5	0.24	86	17.4	2.2	150	0	0	0
Cadmium	77	35	0.063	15	3.88	1.2	0.38	20	14	0
Copper	64	27	0.45	44	15.1	0.61	3.2	23	1	0
Iron	65	25	5	1,800	82.1	4.36	1,000	1	0	0
Lead	68	30	0.12	89	13.9	1.73	1.09	18	10	0
Manganese	65	21	0.18	490	42.8	2.59	20.4	4	1	0
Zinc	77	57	3.4	2,600	236	2.15	42	30	8	0

ATTACHMENT 4
Screening Levels

SCREENING LEVELS

Based on the results of the human health and ecological risk assessments, 10 chemicals of potential concern (COPCs) were identified for inclusion and evaluation in the RI. The COPCs and appropriate corresponding media (soil, sediment, groundwater, and surface water) are summarized in Table 1. For each of the COPCs listed in Table 1, a screening level was selected.

The screening levels were used in the RI to help identify source areas and media of concern that would be carried forward for evaluation in the feasibility study (FS). The following paragraphs discuss the rationale for the selection of the screening levels.

Applicable risk-based screening levels and background concentrations were compiled from available federal numeric criteria (e.g., National Ambient Water Quality Criteria), regional preliminary remediation goals (PRGs) (e.g., EPA Region IX PRGs), regional background studies for soil, sediment, and surface water, and other guidance documents (e.g., National Oceanographic and Atmospheric Administration freshwater sediment screening values). Selected RI screening levels are listed in Tables 2 through 4.

For the evaluation of site soil, sediment, groundwater, and surface water chemical data, the lowest available risk-based screening level for each media was selected as the screening level. If the lowest risk-based screening level was lower than the available background concentration, the background concentration was selected as the screening level.

Groundwater data are screened against surface water screening levels to evaluate the potential for impacts to surface water from groundwater discharge.

For site groundwater and surface water, total and dissolved metals data are evaluated separately. Risk-based screening levels for protection of human health (consumption of water) are based on total metals results, therefore, total metals data for site groundwater and surface water were evaluated against screening levels selected from human health risk-based screening levels. Risk-based screening levels for protection of aquatic life are based on dissolved metals results, therefore, dissolved metals data for site groundwater and surface water were evaluated against screening levels selected from aquatic life risk-based screening levels.

Table 1
Chemicals of Potential Concern

Chemical	Human Health COPC			Ecological COPC		
	Soil/Sediment	Groundwater	Surface Water	Soil	Sediment	Surface Water
Antimony	X	X				
Arsenic	X	X	X	X	X	
Cadmium	X	X	X	X	X	X
Copper				X	X	X
Iron	X					
Lead	X	X	X	X	X	X
Manganese	X		X			
Mercury			X		X	
Silver					X	
Zinc	X	X	X	X	X	X

Table 2
Selected Screening Levels for Groundwater and Surface Water—Coeur d'Alene River Basin and Coeur d'Alene Lake

Chemical	Surface Water Total (µg/L)	Surface Water Dissolved (µg/L)	Groundwater Total (µg/L)	Groundwater Dissolved (µg/L)
Antimony	6[a]	2.92[b]	6[a]	2.92[b]
Arsenic	50[a]	150[c,d]	50[a]	150[c,d]
Cadmium	2[e]	0.38[b]	2[e]	0.38[b]
Copper	1[e]	3.2[c,d]	1[e]	3.2[c,d]
Iron	300[a]	1,000[c,d]	300[a]	1,000[c,d]
Lead	15[a]	1.09[b]	15[a]	1.09[b]
Manganese	50[a]	20.4[b]	50[a]	20.4[b]
Mercury	2[a]	0.77[c,d]	2[a]	0.77[c,d]
Silver	100[a]	0.43[c,d]	100[a]	0.43[c,d]
Zinc	30[e]	42[c,d]	30[e]	42[c,d]

[a]40 CFR 141 and 143. National Primary and Secondary Drinking Water Regulations. U.S. EPA Office of Water. Office of Groundwater and Drinking Water. http://www.epa.gov/OGWDW/wot/appa.html. October 18, 1999.
[b]Dissolved surface water 95th percentile background concentrations calculated from URS project database.
[c]Freshwater NAWQC for protection of aquatic life are expressed in terms of the dissolved metal in the water column.
[d]Freshwater NAWQC for cadmium, copper, lead, silver, and zinc are expressed as a function of hardness (mg/L of CaCO3) in the water column.
Values above correspond to a hardness value of 30 mg/L.
[e]Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. U.S. Department of
Energy. Office of Environmental Management. ES/ER/TM-96/R2. Value based on total metals concentration.

Note:
µg/L - microgram per liter

Table 3
Selected Screening Levels for Surface Water—Spokane River Basin

Chemical	SpokaneRSeg01		SpokaneRSeg02		SpokaneRSeg03	
	Surface Water Total (μg/L)	Surface Water Dissolved (μg/L)	Surface Water Total (μg/L)	Surface Water Dissolved (μg/L)	Surface Water Total (μg/L)	Surface Water Dissolved (μg/L)
Antimony	6[a]	2.92[b]	6[a]	2.92[b]	6[a]	2.92[b]
Arsenic	50[a]	150[c]	50[a]	150[c]	50[a]	150[c]
Cadmium	2[e]	0.38[b]	2[e]	0.38[b]	2[e]	0.38[b]
Copper	1[e]	2.3[c,d]	1[e]	3.8[c,d]	1[e]	5.7[c,d]
Iron	300[a]	1,000[c]	300[a]	1,000[c]	300[a]	1,000[c]
Lead	15[a]	1.09[b]	15[a]	1.09[b]	15[a]	1.4[c,d]
Manganese	50[a]	20.4[b]	50[a]	20.4[b]	50[a]	20.4[b]
Mercury	2[a]	0.77[c]	2[a]	0.77[c]	2[a]	0.77[c]
Silver	100[a]	0.22[c,d]	100[a]	0.62[c,d]	100[a]	1.4[c,d]
Zinc	30[e]	30[c,d]	30[e]	50[c,d]	30[e]	75[c,d]

[a]40 CFR 141 and 143. National Primary and Secondary Drinking Water Regulations. U.S. EPA Office of Water. Office of Groundwater and Drinking Water. http://www.epa.gov/OGWDW/wot/appa.html. October 18, 1999.
[b]Dissolved surface water 95th percentile background concentrations calculated from URS project database. Technical Memorandum. Estimation of Background Concentration in Soils, Sediments, and Surface Waters. Coeur d'Alene Basin RI/FS. URS. May 2001.
[c]Freshwater NAWQC for protection of aquatic life are expressed in terms of the dissolved metal in the water column.
[d]Freshwater NAWQC for cadmium, copper, lead, silver, and zinc are expressed as a function of hardness (mg/L of CaCO3) in the water column.
[e]Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. U.S. Department of Energy. Office of Environmental Management. ES/ER/TM-96/R2. Value based on total metals concentration.

Note:
μg/L - microgram per liter

Table 4
Selected Screening Levels—Soil and Sediment

Chemical	Upper Coeur d'Alene River Basin		Lower Coeur d'Alene River Basin		Spokane River Basin	
	Soil (mg/kg)	Sediment (mg/kg)	Soil (mg/kg)	Sediment (mg/kg)	Soil (mg/kg)	Sediment (mg/kg)
Antimony	31.3[a]	3.30[b]	31.3[a]	3[c]	31.3[a]	3[c]
Arsenic	22[b]	13.6[b]	12.6[b]	12.6[b]	9.34[b]	9.34[b]
Cadmium	9.8[d]	1.56[b]	9.8[d]	0.678[b]	9.8[d]	0.72[b]
Copper	100[d]	32.3[b]	100[d]	28[c]	100[d]	28[c]
Iron	65,000[b]	40,000[c]	27,600[b]	40,000[c]	25,000[b]	40,000[c]
Lead	171[b]	51.5[b]	47.3[b]	47.3[b]	14.9[b]	14.9[b]
Manganese	3,597[b]	1,210[b]	1,760[a]	630[c]	1,760[a]	663[b]
Mercury	23.5[a]	0.179[b]	23.5[a]	0.179[b]	23.5[a]	0.174[c]
Silver	391[a]	4.5[c]	391[a]	4.5[c]	391[a]	4.5[c]
Zinc	280[b]	200[b]	97.1[b]	97.1[b]	66.4[b]	66.4[b]

[a]U.S. EPA Region IX Preliminary Remediation Goals for Residential or Industrial Soil http://www.epa.gov/region09/wasate/sfund/prg. February 3, 2000.
[b]Technical Memorandum. Estimation of Background Concentration in Soils, Sediments, and Surface Waters. Coeur d'Alene Basin RI/FS. URS. May 2001.
[c]Values as presented in National Oceanographic and Atmospheric Administration Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle, WA. M. F. Buchman, 1999. Values generated from numerous reference documents.
[d]Final Ecological Risk Assessment. Coeur d'Alene Basin RI/FS. Prepared by CH2M HILL/URS for EPA Region 10. May 18, 2001. Values are the lowest of the NOAEL-based PRGs for terrestrial biota (Table ES-3).

Note:
mg/kg - milligram per kilogram